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1990 CSICOP Conference

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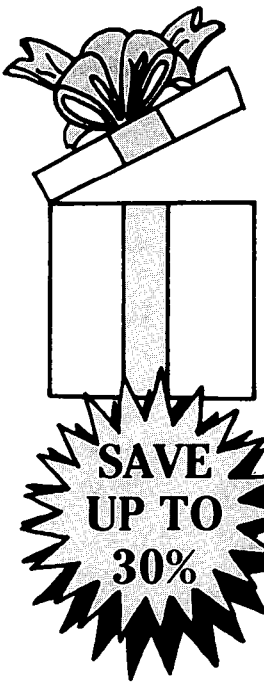

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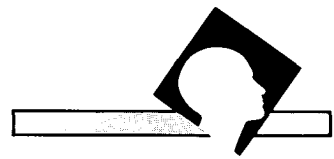
Skepticism in the Light of Scientific Literacy

LYS ANN SHORE

When it comes to challenging extraordinary claims, incredulity isn't enough. What's required is a sufficient background and knowledge to grasp the nature and extent of the claim, and to examine its elements critically. Today, when pseudoscience and fringe-science borrow the concepts and vocabulary of science, it takes a measure of scientific literacy to analyze and evaluate their claims properly. That was the chief message of this year's CSICOP conference, held in Washington, D.C., March 30-April 1, 1990, and devoted to the theme of "Critical Thinking and Scientific Literacy"—arguably the most important issue CSICOP could address.



The 1990 CSICOP conference examined scientific literacy, science education, and critical thinking.

Two conference sessions illuminated the theme: "Scientific Literacy" and "Critical Thinking in Public Education." Several other sessions focused on traditional areas of skeptics' concerns: astronomy and pseudoscience, psychic phenomena and the laws of physics, and UFOs. This article will be devoted to the theme sessions, and to the controversial session on animal rights (see p. 12), which opened a new direction for CSICOP.

CSICOP Chairman Paul Kurtz, professor of philosophy at SUNY-Buffalo, set the tone of the conference in his opening remarks on Friday

morning by emphasizing the urgency of the topic. Citing examples of the scientific and mathematical illiteracy of many American students today, Kurtz advocated that "at least a rudimentary understanding of nature and of the place of the human species within it be conveyed to the student population" at all levels of the U.S. educational system. He also emphasized the importance of the general public's being able to appreciate the scientific picture of the universe.

Recitation of scientific facts is *not* the way to reach this goal; what is necessary, Kurtz said, is the understanding that science consists of a method—critical thinking—and not just a body of knowledge. He identified six key aspects of critical thinking:

- Problems must be carefully analyzed and clarified before they can begin to be solved.
- Beliefs must be recognized as tentative hypotheses unless and until they are confirmed.
- Evidence is central to judging and testing hypotheses.
- Ideas are analyzed using the methods of logical analysis and evaluated by whether or not they contradict other, well-established findings.
- The quest for absolute certainty must be recognized as alien to the scientific attitude, since scientific knowledge is fallible, tentative, and open to revision and modification.
- An open mind, willing to consider daring and novel departures in thought, is required.

As our society changes, so do the issues that citizens must address with critical thinking. What is enduring, Kurtz concluded, is the need to apply critical thinking not only as an antidote to nonsense and pseudoscience but as a positive instrument for the improvement of human society.

Scientific Literacy

The opening session demonstrated how far most Americans fall short of achieving scientific literacy. Michael Zimmerman, a professor of biology at Oberlin College, undertook to show the boundaries and some of the consequences of problems associated with scientific illiteracy. He presented a selection of results from his surveys measuring the pseudoscientific beliefs of elected officials, newspaper editors, school board presidents, and high school biology teachers. This included surveys of groups not covered in his article in the Winter 1990 *SI*. Zimmerman's primary emphasis was on the creation-evolution controversy, one of his longstanding interests as an evolutionary biologist—but he also considered such subjects as communication with the dead, extraterrestrials and ancient monuments, psychic predictions, and astrology. He expressed his results in a double-negative form, citing "those who did *not dis*agree strongly" with a given statement. His reason: "I think these are issues on which people *ought* to disagree strongly." The responses to the various surveys showed that substantial minorities, and in some cases majorities, of these groups expressed some degree of acceptance of these beliefs.

Zimmerman believes the responses to his surveys should "give us great fear over the kinds of scientific and technological decisions our elected officials are making." For example, if public officials believe the earth was created in 4004 B.C., they're likely

to dismiss any concern about a worldwide temperature increase of a few degrees, because after the cataclysmic events of Noah's flood, a mere rise in temperature seems insignificant. Zimmerman surveyed both elected officials in Washington (members of Congress) and Ohio state legislators; while the rates of response were low (about 18 percent for federal officials, 30 percent for state legislators), the results showed an interesting contrast on the issue of creationism. State-level legislators showed much higher levels of acceptance of creationism than did members of Congress, a difference that Zimmerman attributes to the well-attested interest of creationists in activity at the state and local levels, rather than nationally.

Zimmerman also contends that "the consequences of scientific illiteracy fall disproportionately on minorities." For example, the pattern of Ph.D. degrees awarded in 1988 shows that 800 mathematics degrees were awarded nationwide; of these, only four went to black Americans and only five to Hispanic Americans. Other studies have indicated that race is the primary factor determining the location of toxic waste dumps in the United States. Zimmerman believes that "scientific knowledge empowers people." He maintains that this discrepancy in scientific literacy among U.S. minority communities is growing. "We absolutely need to do something about that. We must reach out beyond the middle class and the well educated," he concluded.

John Paulos, the session's second speaker, is a mathematician (Temple University) who is embarrassed about other people's lack of embarrassment at what he calls "even the most egregious mathematical solecisms." It's a foible found even in otherwise

John Paulos, author of *Innumeracy*.

well-educated and precise individuals, including "those who would cringe if anyone were to confuse *imply* and *infer*." Paulos, known for his recent best-selling book *Innumeracy*, defined innumeracy as the mathematical analogue of illiteracy. Unlike illiterates, however, those afflicted with innumeracy often seem to take a perverse pride in their ignorance of mathematics. Yet the consequences of innumeracy are serious; they include muddled personal decisions, muddled government policies, and an increased susceptibility to pseudoscience.

Paulos points to *number* and *chance* as the two key elements of numeracy. It is important for people to develop an appreciation of what kinds of quantities are appropriate in various contexts and an understanding of some basic probabilities. "Without some feel for certain common numbers, and some rudimentary arithmetic skills, it's hard to react

appropriately to certain terrifying statistics we hear repeated," Paulos says. Consider, for example, the comparative probabilities of dying in a plane crash as the result of a terrorist attack—a risk that many Americans take seriously enough to cancel their European vacation plans in the wake of such an incident—and of dying in a car accident, the possibility of which does not lead many people to give up driving or riding in cars. Yet the true probability of the former is only about 1 in 1.6 million, and of the latter, 1 in 5,300.

Paulos recommends that people make up their own sets of large numbers for comparison, to enable them to make informal but vivid quantitative comparisons. He used the example of seconds as a way to handily remember the vast difference between a million, billion, or trillion of something: a million seconds tick by in 11 and a half days, while a billion seconds make up 32 years, and a trillion seconds equal 32,000 years. By keeping that comparison in mind, for instance, people would be less likely to panic when they find that the fruit they've been feeding to their baby contains a few parts per *billion* of some substance that might pose a risk at the level of a few parts per *million*.

Why is innumeracy currently so widespread in the United States? Paulos points first to the misconception that "math = computation." In fact, he says, "math has as much to do with computation as literature does with typing." Other factors are poor mathematics education; prevailing cultural attitudes to mathematics, such as pride in ignorance and the concept of "math anxiety"; and the lack of good math teachers.

Paulos advocates developing a "quantitative perspective" and a "warmly rational" approach that would help people use mathematical concepts appropriately in everyday life. It's important, he said, to show students how mathematics arises naturally in ordinary contexts. "Math is too far divorced from their daily lives and the rest of the curriculum, and is too frequently identified with rote repetition, authoritarian methods, and rigid rules." While math drill is important, math education needs to focus on higher-level skills, such as interpreting graphical and statistical information; modeling situations mathematically; estimating and comparing magnitudes; proving and manipulating; heuristic problem-solving; and developing a certain critical distance and skepticism toward mathematical matters.

The popularity of Paulos's book has gone some way toward raising the public consciousness about the problem of innumeracy, especially in the current climate of concern over the American educational system. Nonetheless, Paulos believes the United States, in spite of its critical dependence on math, remains "largely indifferent to the innumeracy of some of its brightest citizens."

The session's final speaker, philosopher Robert Crease, took the discussion of scientific literacy to a different level: the understanding of the nature of science, or scientific literacy, among philosophers. Crease, who is a historian at Brookhaven National Laboratory as well as a philosophy professor at SUNY-Stony Brook, pointed out that in philosophy of science, very little attention has been given to the actual workings of science, as seen in the laboratory. Thus, he said, philosophers have inadvertently contributed to a "mythic picture of science," in which science is seen as a matter of

"theory making," while experimentation is viewed merely as "theory testing."

In Crease's view, this lack of probing beneath the myth can be called "scientific illiteracy among philosophers." In fact, the mythic view of science has become so prevalent that "scientists themselves understand and interpret their work in terms of the myth even when they suspect its mythic aspects." Philosophers are the ones who should examine rigorously the mythic account of science because of their "professional charge to study the nature and practice of human activities from a critical perspective."

Crease identified two schools of philosophy that have examined science: logical positivism and social constructivism. According to the former, science discovers unchanging valid truths, and its findings have permanent value. According to the latter, science is a human product arising from a historical and cultural context.

Crease believes the challenge to philosophers is to show how science can be affected by historical, cultural, and social pressures and still contribute to the discovery of truth. "Science is undoubtedly affected by forces—economic, historical, cultural, political, and psychological—but it does not reduce to these. It still discovers truths about nature, not only in spite of but thanks to these influences."

The absence of a comprehensive and philosophically adequate account of science has important consequences, Crease believes. One of these involves distinguishing scientific fraud from human error and self-deception. If science is viewed as an impersonal discovery of larger truths, then mistakes are likely to be viewed

CSICOP 1990 Awards

The Committee for the Scientific Investigation of Claims of the Paranormal presented three awards at its 1990 conference in Washington, D.C., March 30-April 1.

Gerard Piel, chairman emeritus of *Scientific American,* was presented the "In Praise of Reason Award," given "in recognition of his distinguished contributions to the use of critical inquiry, scientific evidence, and reason in evaluating claims to knowledge." Piel also delivered the conference Keynote Address.

Richard Berendzen, astronomer and educator, received the "Public Education in Science Award," given "in recognition of his distinguished contribution to the testing of scientific principles and to the public understanding of science."

Stephen K. Doig, science editor, *Miami Herald,* received the "Responsibility in Journalism Award," given "in recognition of his outstanding contributions to fair and balanced reporting of paranormal claims."

as fraud. If science is seen as a human activity, then human error becomes a possibility. Another consequence is that misconceptions about the aims and practices of science influence the public perception of science and scientists.

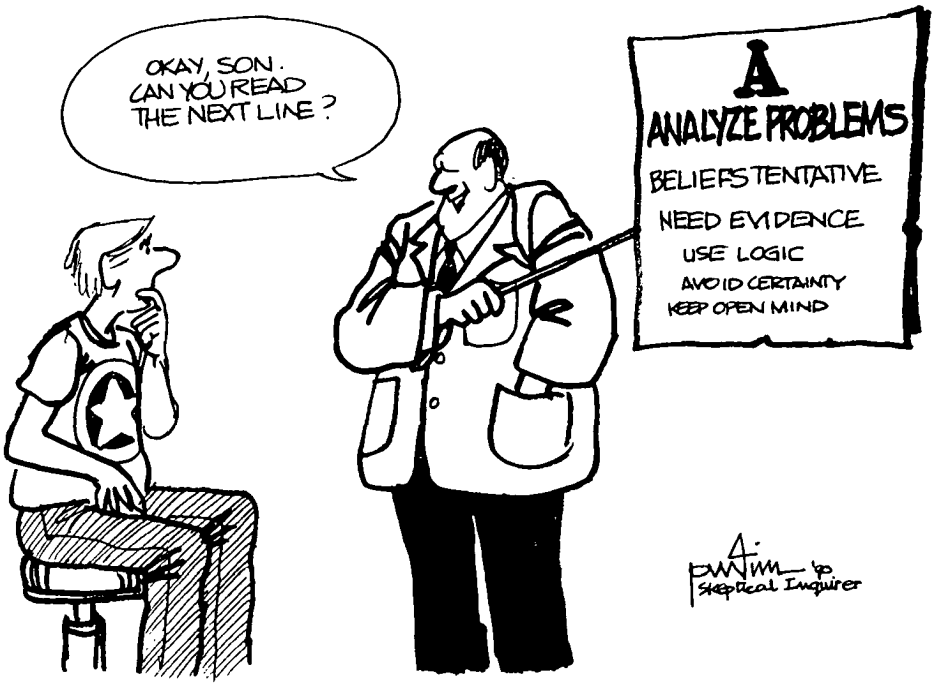
In Crease's view, a crucial element in scientific literacy is a better understanding by philosophers of the nature of science, and this would go a long way toward improving scientific literacy on other levels as well.

Critical Thinking in Public Education

Introducing the session on critical thinking in schools, moderator Paul MacCready of AeroVironment, Inc., emphasized the importance of what he calls "stirring the pot" in public education. "I'm always looking for ways to get things going in public education that can further the development of critical thinking skills," he said.

Anton Lawson, a zoologist at Arizona State University and director of Arizona's Program for the Enhancement of Biology Teaching, outlined a teaching method designed to help students develop the critical-thinking skills they need to evaluate competing explanations. Recent studies show that students who lack critical-thinking skills are not only more likely to hold scientific misconceptions but also less likely to discard their misconceptions as a consequence of instruction.

This new method, called the "learning cycle," was designed as an alternative to the traditional method of science teaching. Lawson illustrated the contrast by asking the audience to pick out patterns in an array of imaginary creatures, called *skints* and *mellinarks,* shown on a slide. He described the traditional method as one in which the teacher introduces a term, gives students examples and nonexamples of the term, then tests the students. Lawson pointed out that this method does lead to acquisition of a concept, but it also encourages students to rely on teachers to impart knowledge. In the learning-cycle method, on the other hand, students first have the chance to examine and



explore data and to identify a pattern. The teacher then introduces a term and links it to the pattern students have observed, and finally students apply the concept. Thus, students learn a concept, just as in the traditional method; the key difference is that they rely on themselves to acquire this new knowledge, rather than looking to the teacher as an authority.

Lawson has found the learning-cycle method to be a highly successful way to foster students' critical thinking skills. Developing these skills is crucial, he believes, in order for students to become able to recognize, examine, and replace "personally constructed beliefs" that happen to be "counter to scientific knowledge."

In a lively talk called "Why Critical Thinking Often Isn't," biologist Richard Schrock of Emporia State University, Kansas, took a different view. He sees the current emphasis on critical thinking in the schools as a fad that in a few years will give way to the next trend. His main criticism of critical thinking curricula is that most attempt to teach critical thinking through the question-and-answer technique and textbooks alone. But in Schrock's view, contact with the real world is a fundamental element of scientific investigation that must not be neglected in science education.

Instruction in critical thinking that keeps students focused on textbooks can have important negative consequences. Since critical thinking curricula often promote "equal time" for the different sides of controversial issues, these "pro and con" discussions may lead students to develop wrong

answers. Worse, students are likely to feel a sense of ownership in the incorrect explanations they have developed. The key in developing critical thinking is for students to use their new knowledge in the real world.

Reality holds several advantages as a test of students' new knowledge: they experience a genuine rather than a contrived interaction; they can test truthfulness; and the experience has real consequences. Schrock is acutely aware of the glib distortions of fact that can creep into textbook and classroom explanations that remain unchecked against the reality of actual experience. He believes that "real lab and field experiences are being desperately eroded" in science curricula. Schrock points to several additional factors that contribute to poor science education: reduction of science teachers' preparation, development of "noncontent" curricula, and reduction in technical vocabulary. As for critical thinking, it is crucial to recognize that "the only valid critical thinking strategies are those that allow students to confront real-world phenomena directly."

Steven Hoffmaster, a physics professor at Gonzaga University and chairman of CSICOP's Education Subcommittee, believes that "no one approach to an issue as complicated as teaching can possibly work." He outlined several models of classroom style and presentation in teaching critical thinking. Dubbing these "hardball," "softball," and "compromise" approaches, he followed with a description of his own teaching technique in his course on the paranormal.

The hardball approach is the traditional model of the teacher-lecturer, in which the teacher dispenses knowledge to (presumably eager) students. This model works particularly well in physics classes, Hoffmaster pointed out, but it also can be polarizing, confrontational, and counterproductive. Students may become alienated, and they may perceive the method as involving a choice between different and equal systems.

The softball method is one of small-group discussion, based on the notion that, as it is often expressed, "we all have something important to share." However, such discussions are frequently dominated by one or two voices; these tend to be the voices of students who have preconceived notions on the subject. The discussion method downplays facts and coherence by taking all opinions seriously and treating them as equally valid. What Hoffmaster called the "New Age approach" takes this method to the extreme by encouraging students to make a free choice among alternatives.

In the compromise method, an instructor's perceived attitude is half the battle. It involves a lighter approach on the part of the instructor, one that is "entertaining but informative." Applying this technique to his own course on the paranormal, Hoffmaster finds that it allows him to "treat drivel as it deserves, without appearing to proselytize." He begins by lecturing on a few popular paranormal topics and debunking them. He then picks out common themes, such as errors in reasoning. A discussion of scientific concepts, such as the conservation of energy, follows. He then proceeds to more problematic or sensitive paranormal topics, and to concepts like chance and probability.

Hoffmaster expressed some reservations about instruction in critical thinking. First, it implies validation of the scientific viewpoint—a value judgment that may not be universally shared. Second, it depends heavily on

internalization by students, which in turn depends on students' initiative. Third, it may simply shift the level at which the students do *not* understand the process. Fourth, it holds the danger of providing a set of steps to be done by rote under the name of critical thinking.

A Challenge to the Academic Community

Gerard Piel began his keynote address on Friday evening by referring to CSICOP as "the first line of environmental protection." He explained that if discourse can't be kept unpolluted, we can't go on with other aspects of self-government. Piel, the chairman emeritus of *Scientific American* and recipient of CSICOP's 1990 "In Praise of Reason Award," went on to issue a rousing challenge to university professors to make a serious and continuing effort to reform the lamentable situation of science education in the United States.

At the elementary school level, it isn't science that's taught, Piel said, but rather the revelation of facts. Yet "students need to find their way as early as possible to the grounds of knowledge—to know how we know what we know—and the way lies straighter in the natural sciences than in other areas, such as the humanities, which are full of ambiguities that demand mature judgment."

The science education that American students receive falls far short of this ideal, Piel said. Science is taught from textbooks; teacher training is inadequate; and education funding goes more for overhead than for books and teaching materials. Piel believes university professors can help to

Gerard Piel, recipient of CSICOP's 1990 In Praise of Reason Award. (Photo by Donal F. Holway)

improve the state of science education. Drawing on his four decades of experience with *Scientific American*, he cited the example of an earlier curriculum reform movement. In the post-Sputnik era, passage of the National Defense Education Act gave a mandate to professors to improve science curricula. The "New Math" was just one of the products of that reform movement.

The experience of the 1950s and 1960s curriculum reform movement shows that the university professoriate couldn't solve the problem with a one-time intervention. What's needed, Piel believes, is a *continuing* effort of reform that would embody "the liberating objective of the teaching of math and science."

* * *

The speakers who addressed the theme of this CSICOP conference were unanimous in their portrayal of

the grim scene of science education in the United States today. What was less clear, however, is what steps could be most immediately effective in improving the situation. Certainly, in evaluating pseudoscientific claims, such as those of "scientific" creationists, or fringe-science claims, such as those of some animal language proponents, scientific literacy is a prerequisite for critical thinking. Given CSICOP's strong stand and long history in promoting critical thinking, there can be no doubt that scientific literacy must also be a key concern. On the basis of the information presented at the conference, the next step must be to take these twin concerns into the classroom. CSICOP's unique blend of critical and scientific expertise should permit it to assume a leading role in this effort.

Animal Rights: CSICOP Takes a New Direction

The discussions that broke out in the hallway following Saturday's session on "Animal Rights and Scientific Research" centered as much on the appropriateness of the topic for a CSICOP conference as on the ethical issues involved in animal experimentation. There's no doubt that the session was the liveliest one of the entire conference. The session presented a full range of opinion, from the views of a physiologist who conducts research using animal subjects to those of an officer of the Anti-Vivisection Society.

The session was organized and chaired by Lee Nisbet, CSICOP's special projects director and a professor of philosophy at Medaille College. He identified the focus of the session as ethical issues in animal experimentation. "Is the use of living animals in experiments ethical? That depends on the answers to several other questions," he said. These questions include:

- Is the use of animals necessary, or are replacements available?
- If use of animals is necessary, can their numbers be decreased?
- If use of animals is necessary, and the numbers cannot be decreased, what are the implications?
- Are animal subjects treated humanely? What guidelines and regulations exist?
- What groups are best qualified to make decisions in this area?
- Is the issue solely contemporary, or is it also a historical issue?

Leading off the session was Larry Horton, vice-president of public affairs at Stanford University, who noted that the debate over animal experimentation goes back over a century "and has seen no fresh arguments in the past 50 years." He identified two main lines of argument, moral and utilitarian. The former says that animal experimentation is morally wrong, the latter that it is bad science. In Horton's view, it is the moral argument that gives the animal rights cause its fervor, but the argument generally used is the utilitarian one.

Horton claims that the biomedical community occupies a moderate position in the controversy. He explains that alternative methods are preferred by scientists wherever possible, but in most cases these alternatives cannot provide the data needed. Horton

believes that the ultimate victory in the controversy will fall "to those who stake out and hold the moderate ground. If one side really holds a centrist position, then the other side is verifiably extreme."

Next up was Randall Lockwood, a vice-president of the Humane Society of the United States and an officer of the National Capital Area Skeptics. Can one be an advocate both of animal protection and of skeptical, rational inquiry? His answer was a decided yes. Lockwood pointed out that critics of animal experimentation are often characterized as anti-science, anti-intellectual, and anti-human. In reality, he said, the distribution of opinion is broad, and "as with any such distribution, the extremes do stand out, and they are minority positions. The caricature of the typical animal activist as a lab-trashing anarchist is really a straw man based on a small but highly media-worthy element." In fact, he noted, concern over animal protection is a grass-roots movement of millions of people.

Concern over the use of animals in research, Lockwood said, is part of a much larger public concern over the scientific enterprise as a whole. "The American public has become critical, even skeptical, consumers of scientific claims and promises, and is increasingly unwilling to entrust scientists and technocrats with making moral and ethical decisions about how these advances are to be obtained or applied." Changes are needed in science itself, and in science education. This means, Lockwood said, that scientists must address "the hard questions" and listen to the concerns of other groups.

As a veterinarian and dean of the School of Veterinary Medicine at Tufts University, Franklin Loew identified animal welfare as the issue

that "most of all puts vets in the middle among opposing groups." Whose side is veterinary medicine on? "First, animals are our patients. But, also, veterinary medicine has long, strong ties to agriculture, so it needs to be sensitive to agriculture's needs and concerns."

Loew sees the key issue as the changing moral status of animals. Americans, he said, are as ambivalent about what animals are as about what research is. Loew believes that the existing regulatory system is effective and that lab animals have never been treated better than they are today. At the same time, polls show that Americans want the stakes to be high when animals are used in research. "Today, it's not just an issue of whether pain is involved, but of whether animals should be used in research at all." There's a kind of cognitive dissonance about animals in U.S. society, epitomized in the despised and feared street rat on one side of a wall, while on the other side is a member of the same genus and species, carefully caged, and fully protected by governmental and institutional regulations.

Donald J. Barnes has seen both sides of the animal experimentation issue. As a researcher in psychology working for the U.S. Navy, Barnes was involved in research on the effects of radiation on rhesus monkeys. This experience led him to the conviction that much scientific research involving animals is unnecessary. Today, Barnes is director of the Washington office of the Anti-Vivisection Society. He points out that the animal-advocacy movement has already brought about some salutary changes, such as the inclusion of ethical issues in scientific training, and says that "the movement will continue to push in what may seem an extreme way, because sometimes only by applying pressure at the extremes can you cause any change to occur in the middle."

In Barnes's view, the animal-rights issue is essentially a matter of ethics. The ethic of animal rights opened up for him "a world where I don't have to crush the worm on the sidewalk, and where I can't just leave the bird with the broken wing."

Barnes maintains that extrapolation between species ("a dog is a rat is a pig is a boy") is invalid. He also believes that nonanimal alternatives are available for much of the research that now uses animal subjects. In cases where alternatives are not available, what is needed is evaluation of the research itself. "We don't need alternatives for nonsensical experiments. We need to reevaluate and get these people out of the lab who are doing these nonsensical projects."

To physiologist Richard L. Malvin, the issue of animal rights has a very personal aspect. "Accusations of being a torturer, a murderer, and one who does it all for no purpose are hard to take. And to have to stand here and apologize to you for my whole adult life would also be hard to take," he began. A professor of physiology at the University of Michigan, Malvin makes use of animal subjects in his research. He is also involved in issues of ethics and animal care in laboratory research, through professional groups and university committees.

Malvin noted that scientists whose research involves animals are subject to intense and effective scrutiny in the form of institutional and governmental regulations and peer reviews. Each step in conducting a research program, from the initial proposal and grant application to research protocol and publication of results, involves

consideration of humane treatment of animal subjects as well as scientific merit. Laboratories are open settings, he emphasizes, traversed by colleagues, students, administrative workers, and others, in which it would be virtually impossible to conceal shoddiness and abuse.

"Extraordinary claims require extraordinary proof," he concluded, "and extraordinary claims have been made: that my colleagues and I are different from you, that we're not humane, that we do terrible things. I would urge you, please, be cautious—be skeptics."

—*Lys Ann Shore*

Lys Ann Shore, Ph.D., is a writer and editor in Washington, D.C., and a SKEPTICAL INQUIRER *contributing editor.*

Pell Parries Panel on Public Policy and Paranormal

The most visible voices of support for U.S. government involvement in paranormal studies were nowhere to be heard at the CSICOP conference session "Public Policy and the Paranormal." U.S. Senator Claiborne Pell was scheduled to speak, but on the Monday night before the conference began his office said Senate time pressures would prevent him from taking part.

Pell's aide on matters of the paranormal, C. B. Scott Jones, had earlier agreed to substitute for Pell if the senator was unable to come, but he too backed out on the same Monday evening, citing his wife's broken foot, said CSICOP conference organizer Lee Nisbet. Nisbet said verbal assurances had been given by Pell's office the previous June and reconfirmed only a month before the conference.

Pell and Jones have both been outspoken supporters of the paranormal.

Last October news media reported that Pell is the only member of Congress to have an assistant assigned solely to paranormal research. The reports said the aide, Jones, is paid $48,853 a year to keep up with the latest developments in telepathy, UFOs, and ESP.

Nisbet and CSICOP Chairman Paul Kurtz both said they were disappointed at Pell's inability to participate as scheduled. "We were looking forward to hearing from him and understanding the reasons for his deep interest in the paranormal," Nisbet said.

There was unresolved speculation whether a Jack Anderson/Dale Van Atta syndicated column, headlined "Rhode Island's New Age Senator," in the March 20 *Washington Post*—only 10 days before the CSICOP conference—had anything to do with Pell's and Jones's decisions not to participate.

The column said the 71-year-old Pell, "with a long and distinguished career behind him," is now the subject of talk among Senate colleagues about whether he is "past his prime." It referred to him as a "gentle if somewhat odd aristocrat and an earnest politician," but added: "There is another side that his fellow Democrats don't know what to think about—the new-age Pell who befriends psychics and spoon benders, who is fascinated by mind-reading and psychic phenomena, and who thinks

the country would be better off if senators meditated regularly." As an example of his "offbeat" interests, Anderson's column cited Pell's 1988 bill that would have set up a national human resources commission (see *SI*, Winter 1989, p. 126) and described it as a "sort of new-age approach to solving the ills of the world through a vague mission to help people achieve 'full human potential.' " In a hearing, "Pell trotted out experts in Zen, yoga, and transcendental meditation." The bill is languishing in the Senate.

The rest of the column dealt with the prospects of a tough reelection campaign for Pell, unless he retires to pursue his personal interests.

A news article in the *Providence Journal-Bulletin* about Pell's decision not to appear said his office had issued a statement about the senator's lack of time for the CSICOP conference, but quoted Pell as saying, "An exchange [with the critics] would be helpful. I would hope they would extend me an invitation to next year's conference." (Next year's CSICOP conference will be in northern California, not Washington, D.C.) The article also pointed out that Pell's interest in the supernatural "has become a source of ribbing by the media" and referred to the Jack Anderson column.

Psychologist Ray Hyman told the conference session about his experiences and conclusions in working on the National Research Council's Committee on Techniques for the Enhancement of Human Performance (*SI*, Fall 1988). As chairman of a subcommittee that evaluated parapsychology, Hyman and his colleagues examined claims about secret government support of a paranormal project.

Hyman said there are "a small number of people" in the government "impressed by some qualitative experiences, who strongly promote their [paranormal] point of view. . . . There are people out there in the government, like Pell and some people in the CIA, who are pushing very hard. They don't look at scientific evidence at all. They know nothing of the psi laboratory. They've been convinced by powerful subjective experiences. But having a compelling personal experience is not the same as seeing reality."

The kinds of claims bandied about—without empirical support, Hyman said—typically involve such things as having "a psychic look at a photograph of an automobile and telling what's going on inside, who's saying what . . . , even flattening a tire remotely with a pin."

"Some things are probably true," said Hyman. "There *was* created a 'First Earth Battalion' " that would seek to develop and use paranormal abilities. "What's happening," says Hyman, "is a lot of lieutenant colonels, retired, push ideas as consultants to government agencies they used to work for." Some of this is going on regularly, but "no one knows how much—not even in the government, at any level." The projects typically go by code names and avoid reference to the paranormal.

Said Hyman, "A lot of pressure to do these kinds of things comes from the outside, for example, Congress." He referred to a recent *U.S. News* survey that found 20 percent of Congressmen openly favored the paranormal.

As for the NRC report, with its generally negative conclusions about paranormal phenomena—"In the Committee's view the best scientific evidence does not support the view that ESP . . . exists"—Hyman noted

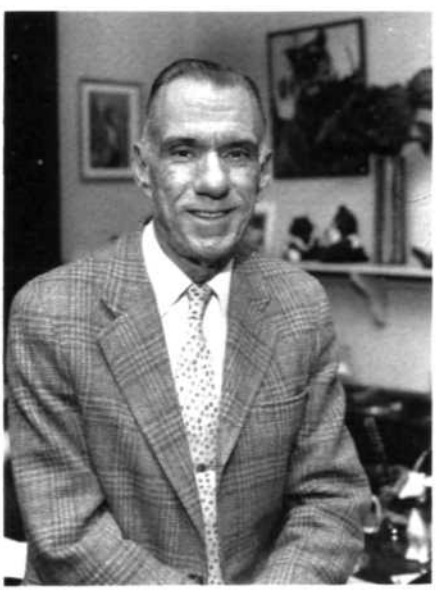
that the Parapsychological Association was very upset with it. The PA, some individual psi researchers, and even a one-sided government hearing organized by Pell and Jones have attacked it strongly. Commented Hyman: "I thought it was very fair."

—*Kendrick Frazier*

Kendrick Frazier is editor of the SKEPTICAL INQUIRER.

Jahn Describes His PK Anomalies Research

"His research is probably the best in the world," is how psychologist James Alcock (York University, Toronto), moderator of the session on "Psychic Phenomena and the Laws of Physics," introduced Robert Jahn. Jahn, dean emeritus of the School of Engineering at Princeton University, is the latest in a long line of physical scientists who have tried to demonstrate definitive evidence for some form of extrasensory abilities, in this case psychokinesis (PK).



Robert Jahn is attempting to demonstrate psychokinesis at Princeton. (Photo by Robert P. Matthews)

It was the first opportunity Jahn has had to present some of his evidence to a CSICOP conference.

Jahn, an invited speaker, said he hoped such discussions would not be seen as "skeptics versus advocates." There are a few people "in the middle, . . . *who are just trying objectively to* make sense out of the subject."

Using modern instrumentation that enables millions of trials, his Princeton Engineering Anomalies Research Program "gets more data points in one afternoon than J. B. Rhine got in his entire career," Jahn said.

The laboratory experiments involve output from an electronic noise circuit that is sampled about a thousand times a second to produce a series of single binary digits. The test subject attempts, by some mental process, to alter the series of random outputs, and to aim for either a high score or a low score. There are also baseline runs where the subject is to make no attempt to influence the outcome.

Jahn showed graph after graph of data from test runs using this "tripolar protocol" indicating small (about 1 bit in 1,000) cumulative deviations from chance, in the positive direction when that outcome was being attempted and in the negative when that outcome was sought. Attempts in the baseline condition showed no significant deviations from chance, he said.

The effect is operator-specific to a degree but not very machine-specific,

he said. Nevertheless, in answer to one of the numerous questions about the experiments from the audience, Jahn said, "There really are no superstars. . . . The operators are nonpaid and anonymous volunteers. None claims special talents." He said they produce effects that are admittedly small and marginal but replicable to a considerable order.

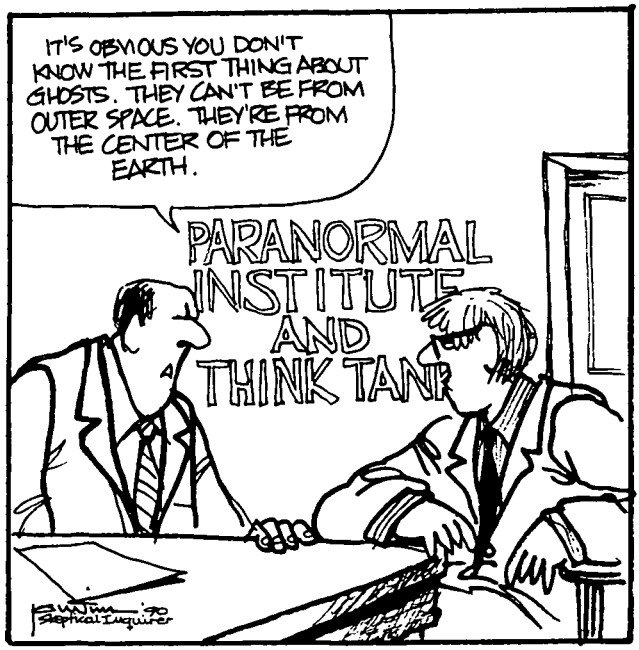
In response to another question, Jahn acknowledged that "one of our operators contributed 20 percent of the data base," but he said "that operator was not the highest effect-size operator."

"The operator specificity has some implications for scientific replicability," said Jahn. "It also bears on our comprehension of what's going on."

No attempt had been made to arrange for a speaker who could provide an evaluation of Jahn's experiments. (The other panel members were physicists Milton Rothman, who spoke on the constraints on paranormal possibilities imposed by the laws of physics, as in his article in the Fall 1989 *SI*, and Victor J. Stenger, on "The Spooks of Quantum Mechanics"; see Stenger's article in this issue.) Rather, the talk provided the opportunity for a CSICOP session to hear Jahn present some of his data and answer questions—of which there were many. He and many in the audience seemed to find the exchange worthwhile.

As yet, there has been very little independent evaluation of Jahn's work. (For a brief one see Alcock's discussion in his new book, *Science and Supernature*, Prometheus 1990, pp. 104-110.) Critics intimately knowledgeable about Jahn's research program say it has many problems. They also emphasize that until the results have been replicated independently, by other experimenters in other laboratories, there is little to take note of scientifically.

—*K.F.*


IT'S OBVIOUS YOU DON'T KNOW THE FIRST THING ABOUT GHOSTS. THEY CAN'T BE FROM OUTER SPACE. THEY'RE FROM THE CENTER OF THE EARTH.
PARANORMAL INSTITUTE AND THINK TANK

News and Comment

Science Teachers Confront Pseudoscience

What should science teachers do about the epidemic of pseudoscience in the everyday life of their students? We put this question to 270 Virginia middle and high school science teachers enrolled in a 1990 television physical-science course broadcast from the University of Virginia's electronic classroom.

We opened the subject in an hour-long lecture dealing with some of the most popular pseudosciences, such as astrology and psychic detection. The lecture also listed the differences between science and pseudoscience and recommended the use of such tools as "Extraordinary claims require extraordinary proofs." Our definition of pseudoscience applied only to subjective claims that try to usurp the role of the scientific method in describing the natural world yet pretend to be scientific.

Finally, we gave each teacher a copy

of an article from the local paper titled "Woman Claims Skull Has Mystical Powers." This article touted a local display (admission $5 a head) by Anna Mitchell-Hedges of the crystal skull she claims to have found in a Maya temple. "It's a skull of love, of healing," she asserts. (See Chapter 3 of Joe Nickell's *Secrets of the Supernatural*, reviewed in this issue.) As homework, we asked each teacher to write an account of how he or she would respond if a student brought this article to the classroom.

The following week the teachers read and discussed their papers with small groups of their cohorts at the eight downlink classrooms around the state. Then the papers were sent to the members of the university physics and chemistry faculty offering the course. We hoped teachers would not only spot the conflict between the claims made for the skull and the scientific principles they were teaching but also devise a strategy for handling like claims in the future.

All but a half-dozen of the 270 teachers saw at once that the claims in the article violated the laws of heat flow and conservation of energy. They knew that science finds no evidence for the skull's origin, and they judged the owner's account of finding the skull dubious.

But the majority also saw the human angle in dealing with a student who brought in such an article. They would be careful to avoid ridicule or outright rejection of beliefs in which others have emotional investment. The most expert teachers would try first to find out what the student thought about the article's claims. If the student or other class members tended to believe the claims, the teacher would open an inquiry process. Some would pose key questions or ask students to critique the claims using tools of science already learned. Others would set up a debate between those who accepted the article and those who doubted, urging them to state their arguments pro and con. In the end the class would decide which arguments were more scientific.

A number of teachers reported actually giving the article to their students as an opening wedge in teaching the nature of science. They found this item useful in getting students to think. A couple of teachers let grade-school kids have a go at it. Their comments were among the most skeptical. Maybe pseudoscience lacks appeal before adolescence.

We also learned that a few teachers shy away from pseudoscientific topics. Some feel that their duty lies in teaching science—period. They feel it is wrong to invade areas of belief. We received letters from three teachers protesting the mention of pseudoscience in the course. Despite the careful wording of our definition of pseudoscience, they viewed this topic as an attack on religious belief. In our personal response to them, we drew the line between beliefs arising from inner experience and claims about the natural world that fail to meet the standards of scientific evidence. At the time we did not have Pope John Paul II's recent statement on Galileo (see *SI*, Spring 1990:239) recognizing the scientific method as "the path toward the knowledge of the world of nature" to quote to those teachers in a Catholic school, but we feel all teachers should keep those words handy.

—*Frances Martin*

Frances Martin is a consultant to the Center for the Liberal Arts at the University of Virginia. The Center sponsored the television course described in this report as part of its efforts to link faculty members with schoolteachers in Virginia.

Astrology Disclaimer Now in 33 Newspapers

We recently listed 28 daily newspapers in the U.S. and Canada that now publish a disclaimer with their astrology columns (*SI*, Spring 1990, pp. 230-231). As a result of that article, we received reports of six other dailies that should be added to this list:

Tucson Citizen (Ariz.)
Hillsdale Daily News (Mich.)
Rochester Post-Bulletin (Minn.)
Kansas City Star (Mo.)
Manchester Union-Leader (N.H.)
Indiana Gazette (Pa.)

Several of these newspapers have been carrying a disclaimer for some time; for others it is a new departure. The *Hillsdale Daily News* began publishing a disclaimer on April 17, 1990, after a local reader discussed the matter with the managing editor and brought supporting material, including our Spring article, to his attention.

The disclaimers printed vary. Some newspapers use the exact text proposed by the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP): "The following astrological forecasts should be read for entertainment value only. Such predictions have no reliable basis in scientific fact." The *Kansas City Star*'s reads, "Note: Horoscopes have no basis in scientific fact and should be read for entertainment, not guidance." The *Tucson Citizen*'s reads: "Astrological forecasts should be read for their entertainment value only. They have no basis in fact."

One daily newspaper that had carried a disclaimer and was included on our earlier list, the *San Jose Mercury News*, no longer does so. An inquiry from *SI* brought the response from Robert D. Ingle, executive editor, that the newspaper dropped the disclaimer when it moved the daily horoscope from the news pages to the comics page. "It is our feeling that the placement now clearly indicates that . . . the horoscope is for entertainment value only. . . . I wish to assure you there has been no change in our attitude about the validity of astrological advice," Ingle said.

So the number of U.S. and Canadian daily newspapers known to carry a disclaimer is now 33. We would appreciate reports from readers about any further additions.

In addition to these North American newspapers, the largest newspaper in Iceland, *Morgunblaoio*, has begun carrying a disclaimer with its astrology column. Thorsteinn Saemundsson, of the Science Institute, University of Iceland, Reykjavik, reports that the newspaper introduced the disclaimer after he had a conversation with the editor.

"My reason for calling the editor was not just to complain about the paper's astrology column (I had done that many times before), but to criticize the paper for a recent report about an astrologer in Denmark." The astrologer had been forecasting a volcanic eruption in Iceland, and the newspaper had taken the story so seriously that they had telephoned Denmark to get further details. "After a heated discussion, the editor finally agreed that the paper had shown a certain lack of judgment. . . , thereby lending respectability to the practice of astrology. Following this, the board of editors decided that the form of the paper's astrology column would be changed and a disclaimer added, based on a copy of the CSICOP text which I sent them. There have already been

favorable comments from some readers who, like myself, take a dim view of this astrology business."

Not surprisingly, the low-key effort to encourage newspapers to carry these disclaimers is not popular with astrologers, especially those who write syndicated horoscope columns. The *Wall Street Journal*, which is one of the very few newspapers that has no astrology column, wrote about the disclaimer campaign in a light-hearted column May 3, 1990. The brief story, "Honestly Now, They Can't Tell Us That They Didn't See It Coming," included the reactions of several horoscope columnists, among them Sydney Omarr, who found the disclaimer trend menacing. "Once you permit this kind of thought control and prejudice, it will go into other areas. . . . Tomorrow it'll be the bridge column, then the financial column."

As for the newspapers that carry the disclaimers, Jim Creighton, the features editor of one of them, the *St. Louis Post-Dispatch*, said simply, "I don't think we should encourage people to think they're getting the scoop on their future."

—*Kendrick Frazier*

Nicholas Sanduleak, Astronomer, Gentle Critic

Nicholas Sanduleak, astronomer and skeptic, died of heart failure on May 8, 1990, at age 56. With his death, the scientific community has lost a true master of observational technique and the skeptical community one of its most insightful, and gentlest, critics of hokum.

Nick lived almost his entire life in and around Cleveland, Ohio, and spent the largest part of his professional career at Case Western Reserve University, where he first enrolled as an undergraduate. He later became a senior research associate in astronomy at the Warner and Swasey Observatory there.

Nick displayed talents for science while in high school and entered Case Institute of Technology as a physics and astronomy student. Following graduation in 1957, during military service, he participated in Werner von Braun's team at the Redstone Arsenal, the team that designed and eventually launched the first American satellite, Explorer 1. But his real devotion was to astronomy, and he returned to Case immediately after being discharged to continue his studies. His Ph.D. thesis broke new ground in the study of the distribution of the low-mass component of the stellar population of the galaxy. His conclusion that the low-mass stars are probably able to account for most of the local mass observed in the disk of the galaxy earned him titular membership in a group dubbed by one astronomer, "The Messiahs of the Missing Mass."

After completing his doctorate, Nick joined the staff of the newly formed Cerro Tololo Interamerican Observatory in Chile. It was during his stay at CTIO that he completed some of his most important and enduring work. He catalogued and described the brightest stars in the two satellite galaxies to ours, the Large and Small Magellanic Clouds. One of the stars in this catalogue, Sk-69°202, proved in 1987 to be the progenitor of Supernova 1987A. He often joked later that now he would have to recall all copies of the work and change them to remove this star. It was also during this period that he studied the atmospheric changes

caused by a volcanic eruption in South America and performed observations of the infrared emission from the Moon during a lunar eclipse. This latter study was his first brush with pseudoscience, since it was later misquoted by creationists in support of the youth of the moon.

In 1968, he returned to Cleveland, and he remained on the staff of the Warner and Swasey Observatory for the rest of his life. There he and colleague C. Bruce Stephenson completed a massive survey of emission line stars in the southern Milky Way, a survey that yielded among other treasures the enigmatic object known as SS433. Nick was never given to small projects or fast results. The corpus of his scientific work is remarkable for the depth and completeness of his approach. Unlike many observational astronomers, Nick was never one to publish quick conclusions or incomplete results. Instead, he pursued his quarry, the luminous objects of the universe, with the zeal of a field taxonomist. He was interested in all of the physical things around him, on the terrestrial and cosmic scales. He wanted to describe them, and to observe how they fit together to form a complete reality. His observational work gradually widened in scope, eventually extending to cosmological studies with Peter Pesch in the *Case Northern Survey*, a search for active galaxies and quasars near the north galactic pole. True to form, Nick also noted and described every interesting object that he observed in the course of searching photographic plate material for these distant galaxies. The first 12 installments of this catalogue have appeared and form a permanent monument to his work.

After the publication of *Objections to Astrology* by the newly formed CSICOP, Nick was one of the first to take up the cause of public skepticism. He was a charter subscriber to SKEPTICAL INQUIRER and attended nearly every CSICOP conference. Though by nature retiring in unfamiliar company, Nick began to take a more visible role in the skeptical movement during the past 15 years. He became involved in field investigations, most notably the "Columbus Poltergeist" case (which he dubbed the "Olentangy Horror"). He was a founding member, with Page Stephens, of the South Shore Skeptics and often spoke before this group and wrote for its newsletter.

Nick is perhaps best known to readers of the SKEPTICAL INQUIRER for his definitive study of the lunar effect ("The Moon Is Acquitted of Murder in Cleveland," *SI*, Spring 1985). In this massive study, conducted exactly in the same fashion as his astronomical work, Nick examined a decade of murder cases in the city of Cleveland, using a more complete database than the one cited in Lieber's original book on the effect. His conclusions, backed by solid and precise statistical arguments, form the best counterexample yet assembled for the lunar effect and have been cited many times.

Nick was a member of the Astrology Subcommittee of CSICOP and, in this capacity, frequently participated in debates with Ohio paranormalists. He appeared many times on Cleveland area radio and television programs and was always willing and eager to speak to school and civic groups and to give public lectures. He established a tradition of delivering talks on the paranormal as part of the Warner and Swasey Observatory public nights program, reaching and educating an audience normally not exposed to such questions.

To the end of his life, Nick was an empiricist and an existentialist. He deeply believed in the ability of the

human mind to encompass the phenomena of the universe. One of his favorite theatrical moments was from the film of Brecht's play *Galileo*. In it, Gassendi enters Galileo's chambers to view for himself the moons of Jupiter. His clerical colleagues wait expectantly outside the chamber for his triumphant appearance and word that he has disproved Galileo's claims. When he appears, Gassendi merely looks at the assembly and says, "He's right," letting the evidence speak for itself, and exits. So was Nick Sanduleak's way. He will be deeply missed.

—*Steven N. Shore*

Steven N. Shore is an astrophysicist at the NASA Goddard Space Flight Center, Greenbelt, Maryland. He is an SI *consulting editor.*

Channeler Confesses

A Providence, R.I., "psychic" who traveled as far as Japan as a channeler for the seventh-dimensional being named "Aria," has a new message: There is no Aria.

"I wouldn't use the word 'sham,' " said Stephen Xavier, who offered New Age advice with a soothing Hindu/Shakespearian accent. "What was being done was always done with the best of intentions."

Xavier told *Providence Journal* columnist Maria Miro Johnson that it suddenly dawned on him one day that the advice was coming from him, not from a ghost.

Xavier subsequently got a manager, made plans to write a book about his experience, and began giving lectures on "Confessions of a Former Trance Channeler."

How did Aria's New Age fans react to his confessions?

Xavier said some believed his advice was sound and didn't care where it came from. Some were angry at him because they felt he had kicked Aria out of his mind. And a third group was convinced that Aria was there all along, but that the spirit had simply abandoned Xavier.

Apparently none of Xavier's customers has tried to get their money back.

—*C. Eugene Emery Jr.*

Soviet Interest in Countering Paranormal Pandemonium

It seems the recent wave of paranormal belief sweeping the Soviet Union (*SI*, Spring 1990) has not gone unnoticed by a number of concerned scientists and science writers in the USSR.

Indrek Rohtmets, editor-in-chief of the Estonian-language popular-science magazine *Horisont* (Horizon), recently wrote to CSICOP Chairman Paul Kurtz stating: "Removing many old taboos, glasnost and perestroika have triggered a boom in the paranormal, too. UFOs, afterlife—almost everything that was forbidden earlier—are now freely discussed. But usually from a viewpoint we cannot completely agree with."

"The SKEPTICAL INQUIRER has aroused great interest among our staff," Rohtmets said. He expressed a desire to translate articles skeptical of the paranormal into Estonian to "introduce our readers to scientifically

correct opinions." CSICOP wrote to *Horisont* (readership 150,000) granting them permission to do so.

It is hoped that through the arrangement with *Horisont* and the previously announced agreements with the USSR's *Science and Religion* (readership 750,000) and the Perspectiva Scientific Center in Kiev, skeptical material will soon help temper the "paranormal pandemonium" in the Soviet Union.

—Barry Karr

Barry Karr is executive director of CSICOP.

The Fiercest Punch: The Physics of a Karate Strike

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In dojos across the land, students of all ages and both genders practice the forward Karate strike, thrusting with clenched fist and a vocal "Kiaa." What they may not realize is that they are using the laws of physics in a highly sophisticated, efficient manner.

"The forward strike and virtually everything in karate is about the most efficient way you can fight. I'm amazed that it is so scientific," states Jearl Walker, a member of the American Physical Society, the largest professional group of physicists in the country. Walker should know. He's a karate black-belt and a physicist who's devoted some time to analyzing the sport.

The power delivered by a karate punch is tremendous. According to Walker, who teaches at Cleveland State University, a beginner's forward strike travels from 12 to 15 MPH and hits with a force of about four times his or her body weight. Black-belt experts punch with a speed of about 25 MPH and strike with a force of about seven times their own weight. But the real reason these punches are so powerful is that they are aimed at an imaginary point slightly behind the target. Walker offers this explanation.

"You want to touch an opponent when your arm is at maximum velocity. That's going to be one or two centimeters just before the arm is fully extended. If you aim behind the target, your fist will reach maximum velocity, and most power, at the target itself. This occurs just before the arm's maximum extension."

The laws of physics also apply to other aspects of the sport. At any karate demonstration it's almost obligatory for a black-belt to smash through a stack of boards with the edge of his hand. This blow would have no effect on one thick board. Yet, several thinner boards split apart dramatically. There's a good scientific reason for this, states Walker.

"The expert actually sends a shock wave through the boards. That shock wave does the snapping for him. The

boards split progressively, one board at a time. That's why a stack of thin boards will split while one thick board won't."

—*American Institute of Physics Science Report*

Long Prison Terms For Fortune-Tellers In Connecticut Case

For the first time in the state of Connecticut—and perhaps nationally—two Gypsy fortune-tellers were arrested, charged, tried, convicted, and sentenced under state anti-racketeering laws. The case is an instructive one, particularly for those who argue that spiritualism and fortune-telling represent "victimless crimes" that the state has no business protecting people from.

In the trial, six persons testified against a mother-daughter team of spiritualists—Gardenia and Mary Ann Ephraim. It is unknown how many other people were exploited by the Ephraims but were too embarrassed to come forward. The newspaper account of the trial as presented in the *Hartford Courant* is an incredibly sad story of frightened, confused, and troubled people who in their despair turned to the Ephraims. Consider the following:

• Joseph Romano and his wife wanted children. She had suffered three miscarriages, and he had become impotent. The Romanos went to the Ephraims seeking a spiritual solution to their medical maladies. The fortune-tellers gave Romano an egg and told him to rub it over his body. When the Ephraims cracked open the egg, what looked like little green snakes emerged, indicating that the problem was the work of evil spirits. Romano was then told to take $13,000 in $100 bills and mold the money into the shape of a cross, which he delivered to the Ephraims. He next was instructed to deliver money and goods to the Ephraims as part of their payment for disposing of the evil spirits that were afflicting him and his wife. Among the items delivered to the Ephraims were two Lincoln Town Cars (rentals), a gift certificate from Sears, bottles of whisky, steaks, hams, shrimp, macaroni salad, paper cups and, of course, cash. The total cost to Romano: $32,000. He worked two jobs to pay off these expenses.

• Robert Knight paid the Ephraims more than $87,000 in cash to ward off an evil curse imposed, according to the fortune-tellers, by his in-laws, who, they asserted, were members of an evil cult. The Ephraims pulled the snakes-in-the-egg gambit on Knight, who was so terrified he took out a second and then a third mortgage on his house to pay the demands of the spiritualists.

• Seventy-year-old Luigi Mancini handed over some $68,000 to the Ephraims—his entire savings for retirement. There were two installments of $26,000. Again, the money was to be shaped into a cross. He was told evil spirits and the devil himself were after his wife. She would die, the Ephraims told Mancini, if he refused to provide the money. He, too, became convinced when he saw an evil substance emerge from an egg he had rubbed over his body.

• Harris Sanders wanted to remove a curse the Ephraims diagnosed as the cause of a failed romantic relationship. He paid some $80,000, in cash, checks, and apparently in truckloads of groceries. Sanders was

arrested for writing more than 100 bad checks to pay for goods he delivered to the Ephraims. He ended up in a shelter for the homeless.

• Robin Jones was told her jewelry contained evil because she had worn it in a car accident. Also, evil spirits were the cause of family illnesses. She handed the jewelry over to the Ephraims so it could be blessed to prevent another accident. The Ephraims returned only some of it. Jones also provided the Ephraims with cash and gift certificates she obtained by borrowing money from friends and bouncing checks. The Ephraims hounded Jones about the cash settlement from the car accident; it was necessary, they told her, to give them the money to be blessed. In one instance Jones accompanied the girlfriend of Gardenia Ephraim's son to a clothing store. Jones paid $700 for a suit she was told was needed to "dress the saints." The total amount Jones provided to the Ephraims is estimated at $18,000.

• When Girsete Vila was told by the Ephraims that evil was causing her goddaughter's arthritis, she paid them $375. When she refused to pay any more than that, the Ephraims told Vila that her goddaughter would die, possibly on that very day.

In the trial record, it was testified that the Ephraims explained their need for money from their clients by stating that "evil follows money and the devil follows money." The Ephraims claimed in their testimony that once the evil had followed the money away from the afflicted, the cash would be returned. Their assertion seems disingenuous—over a two-year period the Ephraims purchased a $73,000 Porsche, a Ford Bronco, a Chevrolet Blazer, and two Corvettes.

In all, the six witnesses for the prosecution were bilked out of more than a quarter of a million dollars. During the investigation, the West Hartford Police Department obtained a warrant to search the Ephraims' house. They found five eggs with holes that had been plugged with wax. They videotaped the opening of one of the eggs (the tape was played at the trial). Inside they found a green, foul-smelling substance. The Ephraims admitted the eggs were a trick to make their clients "feel better." The court decided another way to make those who were the victims, not of evil spirits, but of rapacious fortune-tellers, "feel better." Gardenia and Mary Ann Ephraim were found guilty of a substantial number of counts of first- and second-degree larceny, conspiracy, and racketeering. They received prison sentences of 20 and 15 years, respectively. The sentences are being appealed.

—*Ken Feder*

Ken Feder is professor of anthropology at Central Connecticut State University and an SI *consulting editor.*

Anti-Health-Fraud Group Formed in Britain

The U.K. now has its own Campaign Against Health Fraud, familiarly known as "Quackbusters." Founded in the spring of 1989, the group aims to promote good research practices, consumer protection, and public understanding of the importance of clinical trials. Further, it will propose that patients not be charged for unproved procedures or misleading or false diagnoses, and opposes the

use or promotion of treatments that "may be fraudulent, unnecessary, unduly dangerous, involve needless expense, or prevent patients from receiving the best care."

The founding group of doctors, lawyers, journalists, and others includes physician, author, and television journalist Jonathan Miller; Nick Beard, a doctor and computer scientist; and Caroline Richmond. Richmond wrote an article in 1989 alleging that textile manufacturers were using dangerous chemicals to add unnecessary color to clothes, endangering the public's health and emptying their pockets. She recommended wearing only unbleached muslin. The article was a spoof, but many people wrote to her thanking her for changing their lives and clearing up health problems due to the unsuspected hazard.

The CAHF recently came in for some criticism in the press. Claims were made in the *London Sunday Times* and the satiric magazine *Private Eye* that the group was in the pay of drug companies. Meanwhile, some skeptics were dismayed that the group chose to support the British Chiropractic Association's efforts to set up state registration for its members. The CAHF defended its decision on the grounds that the BCA runs independently assessed training courses and is participating in clinical trials. Further, Caroline Richmond argued in the CAHF newsletter, "the public are entitled to be able to believe that if they go to a chiropractor they are going to one who is properly qualified and registered. At present anyone can put up a sign saying they are a chiropractor even if they don't know a jot about it."

The CAHF and skeptics have agreed to cooperate where possible.

The Campaign Against Health Fraud can be reached at: Box CAHF, London WC1N 3XX, U.K. Membership, which entitles you to receive their quarterly newsletter, is £12, plus an extra £4 airmail postage if you live outside of Britain.

—*Wendy M. Grossman*

CSICOP's Campus Lecture Series

Some years ago the Southern California Skeptics initiated a lecture series at various university campuses in their area. These series are surprisingly popular, and include such well-known figures as Steve Allen and Jonathan Miller.

CSICOP Chairman Paul Kurtz wanted to encourage similar series at other campuses throughout North America, and asked me to initiate one in the Western New York area. Since our population base is much smaller, I planned something on a more modest scale. For the 1989/90 academic year, we planned lectures, cosponsored by various departments at the State University of New York (SUNY) at Brockport, SUNY at Buffalo, and the SUNY College at Buffalo.

We started in September 1989 with two basic introductory talks, and then moved on to more specific paranormal, occult, and philosophy-of-science topics. The first was by Ray Hyman, professor of psychology at the University of Oregon, who gave a talk and demonstration on "How We Are Fooled." The next day Phillips Stevens, Jr., associate professor of anthropology at SUNY at Buffalo, spoke on "Occult Beliefs Today: Social Impediments to Critical Thinking." In October, Robert Basil, editor of *Not*

Necessarily the New Age, spoke on "Whither the New Age Movement?" and James E. Alcock, professor of psychology at York University, Toronto, presented his ideas on "Standards of Proof in Parapsychology." In November Sherman F. Kanagy II, assistant professor of physics and astronomy at Purdue University, discussed the differences between science and scientism in a talk titled "Is Science a Religion?"

In February, CSICOP, the Buffalo Museum of Science, and the Western New York Skeptics co-sponsored a lecture by Michael Ruse, professor of zoology, history, and philosophy at the University of Guelph, Ontario, on the claims made for creationism. In March, Steve Shaw, who was one of the two "Project Alpha" hoaxers at the now defunct McDonnell Laboratory, explained the tricks he used to convince researchers at the lab of his "psychic powers." In April, Shawn Carlson, physicist at Lawrence Berkeley Laboratory, lectured on "Astrology" at SUNY Buffalo. Also in April, Daryl Bem, professor of psychology at Cornell University, spoke on "ESP: What Do We Really Know?" discussing the problems of interpreting anomalous data in everyday life.

CSICOP's goal now is to move beyond Western New York and encourage skeptics' groups and other interested parties to initiate public lecture series in their own areas. We have received enthusiastic letters from a number of subscribers requesting information about starting their own series, and we are happy to say that the first CSICOP Speakers Directory will be available later this year.

—*Ranjit Sandhu*

Ranjit Sandhu is a member of the CSICOP staff in Buffalo.

Science Walks the Hot Coals

John A. Campbell, senior lecturer in physics at the University of Canterbury in Christchurch, New Zealand, leads the firewalk at the New Zealand Skeptics' Fourth Annual Convention. More than 80 people followed him over 12 feet of hot coals. Campbell says the mathematical equation on the sign he carries describes the diffusion of heat through solids. (Photo courtesy Community Newspapers, Christchurch)

Notes of a Fringe-Watcher

MARTIN GARDNER

The Mysterious Finger-Lift Levitation

For centuries, throughout the world, it has been the custom of some children to amuse themselves with the following seemingly paranormal stunt. You may recall participating in such a feat yourself when you were young. The stunt can take numerous forms, but usually goes like this.

A heavy person, say an adult male, is seated on a chair or stool. We will call him the "subject." Two children stand behind him, and two on either side of his knees. One of the children in back puts an index finger under the subject's left armpit. The second child in back puts an index finger under the right armpit. The third child puts a finger under the subject's left knee, and the fourth puts his or her finger under the right knee.

An effort is made to lift the subject, but he is much too heavy. The lift is now repeated, but not until a ritual of some sort has been performed. This ritual can take many forms. Among American children, a common practice is for one child to put a hand palm down on the subject's head. A second child puts a hand on the first hand. This continues until all eight hands have formed a tower, with the proviso that no two hands belonging to the same person are in contact. Everyone presses down for a short time. After this is done, the four fingers are placed under the subject's knees and armpits. Someone counts from 1 to 3. On the count of 3, the lifters hold their breath and lift. Up goes the subject. Indeed, the lift seems so easy that there is a strong feeling on the part of lifters that the subject's weight has somehow miraculously decreased.

Although the stunt works as described, the lift is much easier if each lifter uses both hands. The two forefingers go side by side, palms down, the rest of the fingers closed in a fist. Since both arms now share in the lift, the weight of a 200-lb. person is divided eight ways, so each arm lifts a mere 25 pounds.

Years ago someone told me that the stunt is described by Samuel Pepys in his famous diary, but it was not until this year that I learned from physicist Donald W. Olson, at Southwest Texas State University, in San Marcos, and his wife Marilynn, who teaches English at the same university, where in the diary the trick is described. It occurs in Pepys's entry for July 31, 1665:

> This evening with Mr. Brisband, speaking of enchantments and

spells, I telling him some of my charms; he told me this of his owne knowledge, at Bourdeaux, in France. The words these:

> Voyci un Corps mort,
> Royde come un Baston,
> Froid comme Marbre,
> Leger come un esprit,
> Levons te au nom de Jesus Christ.

He saw four little girles, very young ones, all kneeling, each of them, upon one knee; and one begun the first line, whispering in the eare of the next, and the second to the third, and the third to the fourth, and she to the first. Then the first begun the second line, and so round quite through, and, putting each one finger only to a boy that lay flat upon his back on the ground, as if he was dead; at the end of the words, they did with their four fingers raise this boy as high as they could reach, and he [Mr. Brisband] being there, and wondering at it, as also being afeard to see it, for they would have had him to have bore a part in saying the words, in the roome of one of the little girles that was so young that they could hardly make her learn to repeat the words, did, for feare there might be some sleight used in it by the boy, or that the boy might be light, call the cook of the house, a very lusty fellow, as Sir G. Carteret's cook, who is very big, and they did raise him in just the same manner. This is one of the strangest things I ever heard, but he tells it me of his owne knowledge, and I do heartily believe it to be true. I enquired of him whether they were Protestant or Catholique girles; and he told me they were Protestant, which made it the more strange to me.

James Randi provided the following translation of the verse recited by the French girls:

> Here is a dead body,
> Stiff as a stick,
> Cold as marble,
> Light as a spirit.
> We lift you in the name of Jesus Christ.

The Olsons also sent me pages from *The Lore and Language of Schoolchildren*, by Iona and Peter Opie (1959). After quoting from Pepys's diary, the Opies give another description of the feat by a correspondent who was at a school in Bath in the 1940s:

> The queerest happening I know of I have on my own memory. Some of my form-mates one day resolved to try a trick they had heard of, in which one person sat in a chair, and several others (I think four) stood round, with some part of their hands pressed on the victim's head—I think it was their thumbs. The idea was to continue this in an atmosphere of intense concentration by all (no talking or giggles) for a few minutes, after which it was supposed that the person sitting, contrary to all the laws of nature, would actually become *lighter* and could be lifted by the others as easily as if she were a cushion. This experiment was watched with keen interest by the form, and seemed to have a curiously uncanny effect. Whether by self-hypnotism or not I do not know, but the lifters, with a few fingers only under arm-pits and knees, certainly lifted the seated one with ease and grace into the air, and put her down in the same manner. It was more like real magic than anything else I have seen.

The Opies continue:

> We may add that when we were young we, too, practised this trick, three ways being known to us. In the first, the subject lay down and, if we recollect rightly, there were

four raisers using one finger each; in the second, the subject was seated and there were two raisers using a finger of each hand; in the third, which was the most spectacular, the subject stood on a book with his heels and toes jutting over so that fingers could be placed underneath, and he went up vertically. In this last instance the child had to be smaller than the operators or they could not reach the top of his head to press upon. With us it was considered necessary for everyone taking part to hold his breath throughout the operation. One person counted to ten while all pressed downwards, then everyone swiftly changed to the lifting position.

David Brewster, in his *Letters on Natural Magic* (1862), gives a curiously different version of the lift:

> One of the most remarkable and inexplicable experiments relative to the strength of the human frame, which you have yourself seen and admired, is that in which a heavy man is raised with the greatest facility, when he is lifted up the instant that his own lungs and those of the persons who raise him are inflated with air. This experiment was, I believe, first shown in England a few years ago by Major H., who saw it performed in a large party at Venice under the direction of an officer of the American Navy. As Major H. performed it more than once in my presence, I shall describe as nearly as possible the method which he prescribed. The heaviest person in the party lies down upon two chairs, his legs being supported by the one and his back by the other. Four persons, one at each leg, and one at each shoulder, then try to raise him, and they find his dead weight to be very great, from the difficulty they experience in supporting him. When he is replaced in the chair, each of the four persons takes hold of the body as before, and the person to be lifted gives two signals by clapping his hands. At the first signal he himself and the four lifters begin to draw a long and full breath, and when the inhalation is completed, or the lungs filled, the second signal is given, for raising the person from the chair. To his own surprise and that of his bearers, he rises with the greatest facility, as if he were no heavier than a feather. On several occasions I have observed that when one of the bearers performs his part ill, by making the inhalation out of time, the part of the body which he tries to raise is left as it were behind. As you have repeatedly seen this experiment, and have performed the part both of the load and of the bearer, you can testify how remarkable the effects appear to all parties, and how complete is the conviction, either that the load has been lightened, or the bearer strengthened by the prescribed process.
>
> At Venice the experiment was performed in a much more imposing manner. The heaviest man in the party was raised and sustained upon the points of the fore-fingers of six persons. Major H. declared that the experiment would not succeed if the person lifted were placed upon a board, and the strength of the individuals applied to the board. He conceived it necessary that the bearers should communicate directly with the body to be raised. I have not had an opportunity of making any experiments relative to these curious facts; but whether the general effect is an illusion, or the result of known or of new principles, the subject merits a careful investigation.

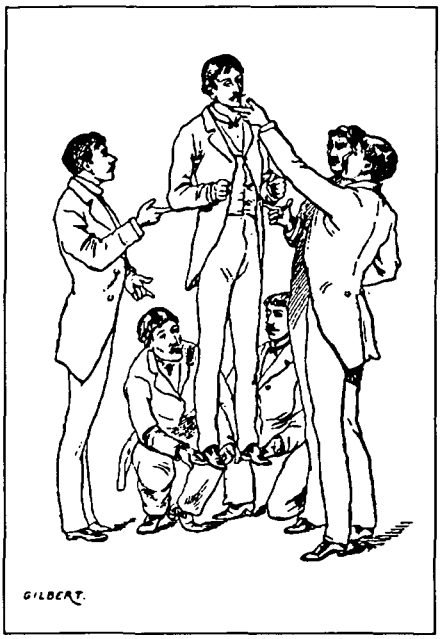
Gaston Tissandier, in *Popular Scientific Recreations* (Paris, 1881), has the subject standing. Two lifters each put a finger under his shoes, two more under his bent elbows, and a fifth puts a finger under the chin. The illustra-

tion shown here is from an English translation of Tissandier's book.

I found still another description in *The Beautiful, the Wonderful, and the Wise*, edited by L. N. Chapin (rev. ed., Philadelphia, 1886):

> A correspondent of the *Scientific American* gives the following, which is vouched for by plenty of good authorities: "I am glad to see the 'buzzing up' process again brought to notice. Fifty years ago the operation was to me a pastime, bewitching and unaccountable as now. It is not (?) animal magnetism; I know as much about that as anybody,—which is very little. I will explain the method of performing this most wonderful feat. A lies on his back on a floor, ground, or an open lounge. B and C (two are as good as four) place their forefingers under the shoulders and hips of A. They breathe in concert by finger signals from A. At the first inhalation B and C lift, but they don't lift; the least effort or grunt breaks the spell, and you begin anew. Thus A is breathed up, the breath lasting, if you are adroit, till you raise him as high as you can reach, when you must catch him, to prevent a fall. The head should be the high test, and then he will come down on his feet. He will feel that the gravitation is out of him; B and C lift only the clothing. He feels—have you ever dreamed of flying? That is it exactly. No need of a close or still room. It can be done out of doors, in a gale as well as in a closet. When you get the knack of it,—and it has once cost me three hours to teach a class,—any two of twelve or fifteen years can toss up a Daniel Lambert like a feather. I do not know that any science can come out of it, but as an amusement, it is the richest thing I ever knew."

I should explain the reference to Daniel Lambert. He was an Englishman (1770-1809), world famous for his enormous bulk. He was 5 feet, 11 inches tall, and weighed 739 pounds when he died. Lambert's name became a popular synonym for immensity. London is the "Daniel Lambert of cities," wrote George Meredith, and Herbert Spencer once called a man a "Daniel Lambert of Learning."



A man held up by five fingers. (From Tissandier's *Popular Scientific Recreations*, 1881.)

Why does the lift work? When four lifters are involved, the weight is distributed four ways. If the subject weighs 200 pounds, each lifter has to raise a mere 50 pounds—40 pounds if there are five lifters. At the first attempt, lifters do not start hoisting at the same instant, and the subject's weight is unevenly distributed. He will tilt to one side, putting a heavier burden on certain lifters. The ritual, and the lift at the end of a count, ensures coordination on the second try. The ritual also induces everyone to try harder.

Holding the breath may also con-

tribute to the lift. Most people stop breathing when they try to lift a heavy object. It has also been suggested that if the lifters press down for a while on the subject's head, this may make their arms feel lighter when they make the lift. (There is another old children's stunt in which you stand in a doorway and press the backs of your hands against the sides of the opening for a minute or two. When you step away, your arms seem to float upward in the air of their own accord.)

It is hard to believe, but a few parapsychologists suspect something paranormal is responsible for this old stunt. Thelma Moss, for example, in *The Probability of the Impossible* (1975), takes this view. The British occult journalist John Randall, in *Psychokinesis* (1982), writes: "No physicist has ever given a 'normal' explanation of this phenomenon." In *The Story of Psychic Science* (1930), the American psychic investigator Hereward Carrington reports on experiments he made with the lift. He had five men perform the levitation on a large platform that registered weight. According to Carrington, the total weight before the lift was 712 pounds. During the lift the scale registered a weight loss of 60 pounds. "I have no theory to offer as to these observations," he writes, "which I cannot fully explain."

In recent years the lift has been routinely demonstrated by Uri Geller in his stage shows. Uri invites on the stage the heaviest person he sees in the audience, along with three others to assist. The first lift attempt invariably fails. Before the second try, Uri's ritual is the usual stacking of hands on the subject's head. Colin Wilson, England's top journalist of the occult, tells of being lifted this way in his book *The Geller Phenomenon* (1976). The lifters were Uri, his old buddy Shipi, and two of his ladyfriends. The book's photos show four stages of this great event. The third photo graces the front cover of *When the Impossible Happens*, a volume in a series called *The Unexplained* (London, 1982). It is one of many predecessors of the current Time-Life series of shameful books promoting the paranormal.

The subject need not be a person. In Shivpuri, a village near Poona, in western India, there is a famous mausoleum containing the remains of Kamarali Darvesh, a Muslim saint. On the ground outside the entrance sits a large stone ball, 14 inches in diameter and weighing about 140 pounds. Any odd number of men, usually five or seven, stand around the ball and touch it with a forefinger at spots on the ball's equator or below. After they recite in unison "Kamarali Darvesh," an attendant gives the signal to lift. The ball slowly rises. Devout Muslims believe this to be a miracle of Allah's. (For a picture of the ball being raised, see the *SI*, Spring-Summer 1978.)

Trying to explain to Muslim fundamentalists that with five lifters each man has to raise only 28 pounds, and with seven lifters, each hoists only 20 pounds, is as fruitless as trying to convince many top psychical researchers that levitations are not commonplace psychic phenomena. ■

Center for Inquiry Debuts on Electronic Media

CSICOP and the SKEPTICAL INQUIRER are participating in the Center for Inquiry, a new project to bring skepticism more forcefully into the electronic media. It will serve as an in-house audio-visual resource center and produce radio, video, and television program materials on science, skepticism, and related themes.

The Center's pilot project, a radio public-service announcement featuring Steve Allen speaking on the importance of critical thinking, is already on national release.

The first seven installments of a more ambitious radio project, "The Voice of Inquiry," will soon begin test airings around the country. Each program is in a half-hour radio news magazine format, loosely based on the successful National Public Radio program "All Things Considered." Skeptically oriented stories include:

- Detailed coverage of CSICOP's recent Washington conference, featuring James Randi, Penn Jillette, Ray Hyman, James Alcock, Bill Nye "The Science Guy," and many others.
- Shawn Carlson, Andrew Fraknoi, and Paul Kurtz on astrology; and Henry Gordon, Steve Shaw, Bob Steiner, and Jamie Swiss on magic and deception.
- David Morrison and James Oberg on the New Catastrophism.
- Joe Nickell on spontaneous human combustion.
- Ivan Kelly, Jim Rotton, Roger Culver, and the late Nick Sanduleak on the effect of lunar phase on human behavior.
- Susan Blackmore on out-of-body experiences.
- Thomas McDonough of the Planetary Society on the search for extraterrestrial intelligence.
- Ray Hyman's thumbnail sketch of the skeptical worldview.

Now in pre-production is a training video introducing the essentials of skeptical inquiry. Future plans include TV-public service announcements, documentaries, and educational programs.

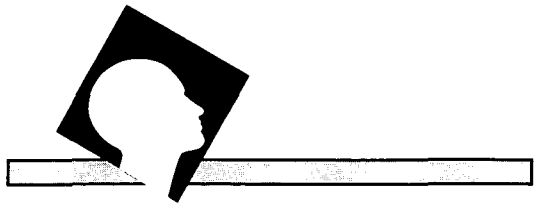
I have been named director of the Center for Inquiry; and at the moment I am the only full-time staff member. Until joining the Center for Inquiry I worked for advertising agencies and video production houses as a writer and director, producing about a hundred training tapes, corporate videos, sales promotion videos, and TV spots and audio pieces on subjects ranging from healthcare to high-tech engineering.

We have installed complete audio and video duplicating systems, equipment for audio mixing and editing, a high-quality system for recording telephone interviews for air, four-track audio production capability, and other basics at minimal expense. We have also been successful in identifying low- or no-cost sources of essential video production services (i.e., studios, field recording equipment and editing suites).

Funding: Donations to the Center for Inquiry are sorely needed to defray operating costs and costs of program production. Please make checks payable to CSICOP with a note indicating that your gift be directed to the Center for Inquiry. Such gifts are tax-deductible.

—*Tom Flynn*

Psychic Vibrations



ROBERT SHEAFFER

Just when it seems that things might finally be looking up for the human race, Satan and his minions have started turning up everywhere. The *San Francisco Chronicle* reports that Pope John Paul II had to appoint six additional exorcists last year for the Diocese of Turin, which seems to be having more diabolical goings-on than anyplace in Italy. Monsignor Corrado Balducci, the Vatican's chief expert on demonology, says that out of every 1,000 persons who believe themselves to be possessed by devils, only 5 actually are. The other 995 are suffering from mental aberrations. Telling which is which can sometimes be a problem, he admits. "Devils are individuals. No two are the same."

Well-known evangelists, including Jerry Falwell and James Dobson, have recently warned parents to be on the lookout for telltale signs that their children are slipping into the clutches of satanic worship—for instance, they should watch for the letters "NATAS," which is "SATAN" spelled backward. Similarly, Cardinal John J. O'Connor of New York in a widely noted sermon linked the excesses of some rock groups to Satanism. Yet in spite of all the alarm in certain religious circles, most serious scholars remain unconvinced that any real network of Satanists exists; sociologist David Bromley of Virginia Commonwealth University noted that "evidence disintegrates as close examination occurs."

In the very forefront of the war against Satan are the followers of political extremist Lyndon LaRouche, who is now serving a 15-year sentence for conspiracy and mail fraud. A LaRouchite review of the skeptical book *Satanism in America*, by Shawn Carlson and Gerald Larue, proclaims that "Satan's army's generals expose themselves in (this) recruitment manual." Calling the book "a satanic manifesto," the *Executive Intelligence Review* claims that the authors "openly adopt the cause of satanism." According to LaRouchite thinking, anyone who openly questions the reality of a vast satanic conspiracy must surely be a part of that conspiracy themselves. The *EIR* specifically names among "the soldier's of Satan's army" CSICOP's chairman Paul Kurtz and Henry Kissinger, who masquerade as a "professor" and a "political consultant," respectively.

* * *

Once again, another dramatic breakthrough advances the art of palmistry by leaps and bounds! And readers of this column are among the first to know. In the Summer 1989 issue of this journal I noted how the *National Enquirer* had succeeded in a daring and unprecedented undertaking: reading the palms of George Bush and Dan

Quayle from an old campaign photo showing them waving to crowds. Then, in the Spring 1990 issue I wrote of Steve MacDonald, the Mensa chiromancer who does palm readings over the telephone, but only for young ladies who are charming, gifted, and gullible.

Now, the Third Wave of palmistry has taken off: fortunes are now being told (and probably made) from photocopies of people's palms! An outfit in San Jose calling itself "Lifelines Hand Analysis" will rush you a "personalized hand analysis" a mere four to six weeks after you send them a check, money order, or credit card draft for $19.90. "Announcing a revolutionary new service that will change the way you think about Palmistry. . . . Simply send us a photocopy of each palm (including 1" of each wrist), and *Lifelines Hand Analysis* will provide you with a completely personalized reading." Ah, the wonders of modern technology!

Who will be the first to capitalize on what will likely be the next Great Leap for Palmkind?: "Fax Us Your Palm."

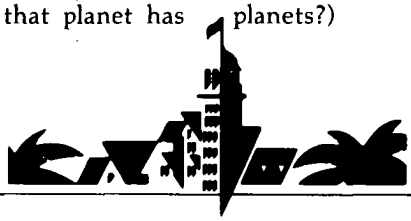
* * *

We've all heard about supposedly "out-of-place" objects—such as human artifacts in strata of rock said to be millions of years old—that have been touted as evidence for the creationist claim that geological time scales are unreliable. Geologist Ian Plimer reports to the Australian Skeptics that he anonymously sent to the Creation Science Foundation in Australia a specimen suggested to be "paper in rock." In reality, it was a clay mineral known as attapulgite. The director of the Creation Science Foundation then wrote an article in his newsletter about this "paper in rock," noting that evolutionary geologists ignore such alleged anomalies, because "the rock is supposed to be more than 200 million years old." Of course the creationists "know" that it, like everything else, is at most a few thousand years old. Plimer observed, "It is clear that at no time was any real research carried out on the rock sample. A simple test would have revealed that [it] was not paper." Noting that attapulgite is used as kitty litter, Plimer concludes, "It would be tempting to write that the creationists are up to their necks in it."

Elsewhere in Creationdom, Russell Humphreys is crowing about the alleged verification of a prediction he made by data from Voyager II. In his article "Beyond Neptune: Voyager II Supports Creation," published by the Institute for Creation Research, Humphreys observes that the magnetic fields measured for Uranus and Neptune agree tolerably well with the estimates he had made in 1984 in the *Creation Research Society Quarterly*, which he calls "a peer-review creationist scientific journal." (*Pravda* may likewise be said to be "peer-reviewed," for the same reasons.) He based his estimates on two assumptions: (*a*) "the raw material of creation was water (based on 2 Peter 3:5, 'the earth was formed out of water and by water')," and (*b*) "at the instant God created the water molecules, the spins of the hydrogen nuclei were all pointing in a

particular direction." (Of course Genesis 1:2 says the universe was "without form and void," which would imply a random orientation of hydrogen nuclei early in the creation process.)

Taking the age of the universe as being 6,000 years, Humphreys argues that if the planets were much older than this, Uranus's magnetic fields would have already decayed to a smaller value, since that planet has little heat outflow to keep a dynamo action going. He admits, however, that neither the creationists nor the long-age scientists predicted the strong tilt of Uranus's and Neptune's magnetic fields from their axes of rotation. Each will presumably have to do a little more work in that area. (Now, which biblical verse was it that talks about the magnetic axes of the planets?) ■



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Seminar Schedule

Friday, November 16

2:00 P.M.-5:00 P.M.: Session I: "Background of the Phenomenon"
5:00 P.M.-7:00 P.M.: DINNER BREAK
7:00 P.M.-9:00 P.M.: Trip to Grasslands Observatory

Saturday, November 17

9:00 A.M.-12 NOON: Session II: "Factors Resisting Skepticism"
12:00 P.M.-2:00 P.M.: LUNCHEON BREAK
2:00 P.M.:-5:00 P.M.: Session III: "IFOs and UFOs: What Causes the Sightings
7:00 P.M.:-9:00 P.M.: BANQUET (optional) $15, $17.50, or $20 (see registration form below).

Sunday, November 22

9:00 A.M.-12 NOON: Session IV: "Claims of UFO Crashes and Abductions
12:00 NOON-3:00 P.M.: Trip to Air Museum (optional)

Registration fee $125.00 (prepayment required). Meals and accommodations not included.

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Neural Organization Technique

Treatment or Torture?

RUSSELL S. WORRALL

Dyslexia, learning disability (LD), minimal brain dysfunction, and the myriad other labels used to describe kids who are not coping in the classroom carry an emotional charge beyond their literal meaning. Students frustrated by repeated failure and parents desperate for a cure are vulnerable to the promises of dubious practitioners offering an easy diagnosis and a quick cure. Professionals, including teachers, and in some cases entire school districts, are not immune to the lure of the sophisticated quack, as the following account clearly demonstrates.

A controversial study raises complex scientific, ethical, and social questions and illustrates the confusion that arises when the distinction between science and pseudoscience is blurred.

The Del Norte Study

In the spirit of open-minded inquiry, the Del Norte Unified School District in northern California during the spring of 1987 elected to participate in a study titled "Efficacy of Correction, and Reliability of Clinical Evaluation of Neurologic Reflex Disorganization and Sphenoid Bone Imbalance, Using Applied Kinesiology (Ferreri Technique) (AK/F) in Grade School Children with Learning Disability: A Multiple Baseline Across Groups Study" (Cooke 1988). The decision to participate in this impressively titled project has had ramifications for the students, parents, and professionals involved far beyond those originally anticipated by the principal investigators and district staff. A critical look at this project can provide a practical example of the problems associated with the treatment of learning disabilities.

The following chronology was compiled from

newspaper reports, videotape of the presentation made to parents, and firsthand accounts from parents and teachers.[1]

Through seminars, an article, and a book, Carl A. Ferreri, a New York chiropractor, promotes the use of applied kinesiology (AK) and a procedure he calls the Neural Organization Technique (NOT) for numerous conditions, including various forms of learning and neurological disorders (Ferreri and Wainwright 1985; Ferreri 1984a; ACLD 1987). The theory is based on the assumption that such disorders are caused by the misalignment of certain bones of the skull and that this may be corrected by manipulation. In response to the intriguing promise of these claims, a psychologist with the Del Norte Unified School District attended a seminar given by Ferreri in November 1985 in San Francisco.

Although Ferreri claimed to have trained more than 600 practitioners in the NOT procedures and treated more than 3,500 patients from around the world, his technique had not been subjected to a formal clinical study. Following the seminar, Ferreri, the district psychologist, and a California chiropractor explored the possibility of pursuing a study within the Del Norte District. They held a meeting with the special-education staff to present their ideas in early 1986. The district psychologist made a formal presentation to the school board, and the project was approved in April 1986. The district was to provide access to the special-education students, fund travel and other miscellaneous expenses, and provide staff for on-site administration, testing, and data collection. The chiropractors would waive their normal fee for treating learning-disabled patients, which averages more than $3,500 per patient.

In May 1986, Ferreri came to Crescent City from New York to make a formal presentation and to answer questions from the community and

the school staff. During this meeting he claimed that he could cure dyslexia and such conditions as enuresis (bed-wetting) and Down's syndrome. The general attitude following this meeting seemed to be one of tacit approval by all except one special-education teacher, who questioned the rationale of the study but was ignored by the district administration. A California-based research consultant specializing in alternative and holistic approaches to health care was retained to design the study.

The AK/NOT project resurfaced in January 1987 with a meeting for the parents of learning-disabled students in the district. At this informational meeting, the Ferreri program was presented as a form of treatment for learning disabilities and other developmental disabilities. Parents were encouraged to complete the "informed-consent form" and to enroll their children in the study. In describing the possible risks, the consent form stated: "There are no reasonably foreseeable risks to you involved as a result of this research project. Depending on the corrective procedures recommended . . . you may experience some momentary and temporary discomfort and/or pain during the actual procedures." With respect to potential benefits, the consent form stated: "Specifically, you may experience some positive behavioral and personality changes, involving a sense of better orientation and greater awareness, improved abilities in school, maturation or even accelerated maturation and personality development." All parents were assured of having their children receive the NOT procedures during the study, as explained in the consent form: "Because of ethical considerations in working with children, a so-called 'single system' multiple baseline type of research design is used, so that ultimately no treatment is withheld from any subject." At this meeting and through home visits with parents the district psychologist enrolled 48 students in the project ranging in age from 4 to 16.

The Del Norte study was begun in February 1987 with the consultant named as principal investigator, the district psychologist serving as the on-site project director and co-investigator, and a California chiropractor and Ferreri named as co-investigators. The district psychologist and staff collected pre-intervention data with intelligence, neurological, and academic tests. The treatment phase conducted by the chiropractors ended in early May, and the post-intervention assessments by district staff were completed by June. Longterm followup continued into the next year.

While vacationing in Utah in August 1987, a kindergarten teacher from the Del Norte District learned of a court action restraining a Utah chiropractor from promoting the treatment of learning disorders with the AK/NOT program (Russan 1987). A defendant in the Utah court action had recently had his Texas chiropractic license suspended for five years for practicing the AK/NOT methods (Hartung 1987). In September, these concerns were presented to the Del Norte school superintendent and to the school board, but because the evidence was considered inconclusive and not relevant to the present study they were dismissed.

In October, four parents of children in the study made complaints before the school board, and several teachers presented a formal statement questioning the validity of the study and the district's continued support of the project. Following the district's lack of response, 17 formal complaints (representing 35 percent of the sub-

jects in the study) were filed with the California Board of Chiropractic Examiners by parents and teachers who felt that some children had suffered emotional and physical harm. This action prompted an investigation by the California Department of Consumer Affairs, which culminated in the Del Norte district attorney filing civil and criminal actions, including charges of "consumer fraud," and seeking more than $200,000 in damages. In addition, civil suits for unspecified damages are pending on behalf of seven children who were subjects in the experiment, naming the chiropractors, the research consultant, the district psychologist, and the school district as defendants. On March 8, 1988, three members of the school board and the district superintendent were defeated in a recall election.

What Can We Learn?

There were many reasons for the controversy that developed in Del Norte County as the AK/NOT study progressed. The study raised complex scientific, ethical, and social questions and provided an example of the confusion that can arise when the distinction between science and pseudoscience is blurred. An examination of the Del Norte study and the AK/NOT theories can be instructive on several levels.

The decision to purchase professional services or to participate in research involving new therapies is a common problem faced by institutions as well as individuals. An excellent standard to employ in this decision-making process was succinctly stated by Jeanette Felix (1987), director of science for the Retinitis Pigmentosa Foundation. Retinitis pigmentosa (RP) is a degenerative eye disease with no known cure, and the RP Foundation must carefully allocate limited funding

"Applied kinesiology has been used by chiropractors and other practitioners for more than 20 years. It has been incorporated as a diagnostic tool into several questionable health practices."

and staff time to those research and clinical studies that offer the highest potential. When considering a new treatment for research, the RP Foundation asks: (1) Does the treatment have a logical rationale? (2) Is there objective preliminary evidence of the treatment's effectiveness? (3) Is there a controlled plan of study? The first two, requiring a logical rationale and objective evidence, apply at the consumer level. They simply demand that the treatment meet commonsense standards.

AK/NOT: Logical Rationale and Objective Evidence?

Because there are many factors related specifically to learning disorders, education and health science professionals are interested in this special population of schoolchildren. Theories about causes of learning disabilities are abundant. These theoretical models attempt to explain behavioral patterns found among these children. Most are based on a logical rationale and draw from a broad base of experimental evidence developed by diverse disciplines, including anatomy, physiology, genetics, psychology, and education. Though drawing from vastly different approaches, such papers as Alkon's

(1983) study of the electrophysiology of learning in a marine snail and Vellutino's (1987) linguistic deficit behavioral model of dyslexia, are consistent with the framework of known facts. However, theories that offer a simple explanation and a quick cure, such as NOT, must be examined carefully before being accepted as viable alternatives to existing theories.

The theoretical model for learning disorders proposed by Ferreri in *Dyslexia and Learning Disabilities Cured* (1984a), and further described in *Breakthrough for Dyslexia and Learning Disabilities* (Ferreri and Wainwright 1985), describes three aspects of the learning disorder question: a theoretical model, diagnostic procedures, and a treatment regimen.

The Ferreri Theory. According to Ferreri and Wainwright (1985:74) the bones of the skull move with respiration through a complicated arrangement of connective-tissue bands. Ferreri proposes that the "mechanism in dyslexia is in the faulty motion in three of the four motions of the sphenoid bone (the center bone of the skull) and at least one of the temporal bones. . . . The learning disabled, on the other hand, only have two sphenoid motions in fault, usually no temporal bone fault, and a cross-energy pattern." Misalignment of the bones of the skull can also result in "ocular lock," making print difficult to read (Ferreri and Wainwright 1985:79). The authors describe a "disequilibrium" involving a dysfunction in something they call the "cloacal reflexes" located in the pelvis, which coordinate with the visual and labyrinthine righting systems.

Ferreri also lists some of the attributes he sees in dyslexia, including "a confusion in the nervous system, so there is no right brain-left brain coordination; right or left dominance (usually cross dominance), . . . a confused thought pattern with reversals of the information fed into it via eyes, ears, etc."

The theoretical model Ferreri proposes is vacuous, making it difficult to critique constructively. The supposedly faulty motion of cranial bones does not offer a logical working model or explanation of any behavioral characteristics seen in learning disordered and retarded populations. Ferreri does not address the specific action of these "motions" on the anatomy and physiology of the cortex of the brain in any of his published works. The theory is strikingly inconsistent with well-established bodies of knowledge, such as anatomy and physiology. Citations supporting the movement of cranial bones or the existence of the various "locks" and "reflexes" described by Ferreri are conspicuous by their absence in the scientific literature. His observations of the "facts" of dyslexia (e.g., crossed dominance, postural stability, etc.) are anachronistic and inconsistent with current behavioral observations (e.g., Brown et al. 1985; Benton and Pearl 1978; Vellutino 1987).

To date, Ferreri has failed to quantitatively demonstrate the motion of the cranial bones or any other of the more complex aspects of his theory. His published works do not cite details of studies or references. A literature search has failed to uncover any published material that provides data to support any aspect of Ferreri's theory.

An example of the quality of Ferreri's approach to scholarly research appears in the reference list accompanying a series of papers he authored on "Basic Neural Organization" (Ferreri 1984b). The complete list of references follows:

1. George Goodheart—research manuals and seminar presentations.

2. David Walther—*Applied Kinesiology*, Vol. 1 and seminar presentations.
3. Major DeJarnette—S.O.T. and cranial seminars and manuals.
4. Playboy series on human sexuality.
5. Craniosacral Therapy-Upledger.
6. Miscellaneous information.
7. Personal research.

This list is worthless to anyone seriously interested in researching the subject, since dates, publishers, etc., are absent. "Miscellaneous information," "Personal research," and a reference to a *Playboy* article are remarkable only for their banality.

The NOT theory and supporting literature are not representative of a rational, scientific approach to any of the subjects presented, including the area of learning disorders, and they simply do not meet commonsense standards.

Diagnosis by Applied Kinesiology. The diagnosis or subgrouping of learning disorders is not a simple task (Kavele and Forness 1987; Fisk and Rourke 1983). Many diagnostic models have been proposed and demonstrated on the clinical level, such as brain electrical activity mapping (e.g., Duffy et al. 1979), regional cerebral blood flow studies (e.g., Hynd et al. 1987), eye movement studies (e.g., Pavlidis 1985), and behavioral measures (e.g., Kirk and Kirk 1976; Myers and Hammill 1982). Ferreri claims that "using special testing techniques from the relatively new science of Applied Kinesiology, a differential diagnosis is possible within minutes." Applied kinesiology (AK) has been used by chiropractors and other practitioners for more than 20 years (Goodheart 1976; ICAK 1983; Walther 1981, 1986). It has been incorporated as a diagnostic tool into several questionable health practices, such as zone therapy and Touch for Health (Marks 1981; Dennison 1982), which also claim to treat learning disorders.

J. Lubecki, a California chiropractor, describes the diagnostic process: "If a person touches a certain area of his body, or of someone else's body, where there is something wrong, his muscles immediately test noticeably weaker. For example, because misalignments of the skull are so common, most people have several areas on their heads which, when tested, cause the person who touches these areas to become weak" (Lubecki 1982:4). One method used by Ferreri (1984a) has the subject lie down and, while the subject touches various places on his head with his hand, attempt to push one leg out to the side against resistance provided by the testor. The testor then makes an estimate of the relative weakening produced by touching each location on the skull. If the patient is incapable of cooperating (e.g., in mental retardation) a surrogate may place a hand on the subject's head and the strength estimation can be carried out on the surrogate (Lubecki 1982:12). A parent (Reitterer) described how this technique was used in the Del Norte study:

> During the evaluation, a procedure was used that was very strange to me. Keelenna, age four, was ner-

"He wrote several words on a piece of paper and placed it in the boy's left hand. Testing the leg strength, he found it to be weak and declared that the boy had dyslexia."

> vous about being handled, so the doctor used me as a surrogate. I lay on the table on my back and Keelenna was placed on me, also on her back. He applied pressure to my raised arms and legs while I resisted. He was able to evaluate Keelenna through my body.

Ferreri also demonstrated a curious method for diagnosing dyslexia, a severe reading disorder, during his presentation to parents. He tested the leg strength of a young boy and found it to be normal. He then wrote several words on a piece of paper and placed it in the boy's left hand. Again testing the leg strength, he found it to be weak and declared that the boy had dyslexia. Somehow the presence of the paper with words on it induced a weakening of the subject's leg muscles!

The "in principle" mechanism for this process is a vaguely defined and yet-to-be-discovered energy transfer possibly related to the energy flows of acupuncture theory (Lubecki 1982:5).

Although the applied kinesiology (AK) diagnostic system has been promoted for more than 20 years, there exists no published evidence to support its clinical efficacy or to elucidate the underlying mechanism for muscle weakening. Either the evidence is anecdotal or authoritative statements are presented without references. Two published reports of masked controlled studies appear to reject the hypothesis that there is any statistically significant relationship between specific muscle strength and organic disorders (Friedman and Weisberg 1981; Triano 1982). These authors suggest that simple subject suggestion and bias on the part of the clinician are the only effects operating during the AK process.

The Ferreri NOT Treatment. Therapy for learning disorders, like their diagnosis presents a perplexing array of approaches. Some have broad application, but many are effective for select subgroups of learning disorders.

The Neural Organization Technique model advocates the manual manipulation of the cranial bones, including the bone to which the eye muscles attach, and manipulation of the pelvis and lower back for all types of learning disorders, cranial injuries, and cases of retardation, such as Down's syndrome. For example, Ferreri states that "the ocular righting reflex is corrected by contacting the mitopic suture of the frontal bone with the heel of the hand, while the fingers contact the lateral aspect of the frontal bone, and lifting with an inhalation assist" (Ferreri 1984b:52). A more graphic example of the therapy is offered by the parent (Eberwein) of a six-year-old patient with a speech delay:

> Two doctors worked on him very intently as I sat across his legs to help hold him down. They focused their attention on his head and mouth areas. They were applying such tremendous pressure to Donald's skull and the roof of his mouth that they would break into a sweat and their bodies would just shake with the force of their exertion. All during this so-called treatment Donald was screaming and struggling to get away from these doctors.

These procedures are claimed to "organize the central nervous system, establish right-brain, left-brain coordination, establish an intact cloacal reflex system, stablilize the gait mechanism, establish normal cranial function and reset the proper eye muscle function with body and hand coordination" (Ferreri 1984a:74).

Ferreri boasts that his "cure" is "simple, inexpensive, uses no drugs,

and is almost instant" (Ferreri 1984a:74). These are extraordinary claims requiring extraordinary evidence. However, the literature on learning disabilities and related disorders is devoid of citations of the work of Ferreri or the Neural Organization Technique. In fact, proponents provide no evidence to support the safety and efficacy of NOT therapy from any sources other than Ferreri's undocumented claim of having cured more than 3,500 patients at his NOT Center (Ferreri 1988). After reviewing the case reports presented in Ferreri's book (Ferreri and Wainwright 1985), the Utah Chiropractic Association's Ethics Committee noted: "In the entirety, we found no true case histories except for fifteen summaries of what may have been case histories found in Chapter 6. The case histories contained no evidence of physical examination, diagnosis, prognosis, and follow-up." The Ethics Committee likened the Neural Organization Technique model to a "one cause, one cure theory of disease which is so inimitable to hucksterism in the health care field" (Jarvis 1987). In a related matter involving the same Utah chiropractor, a Third Judicial District Court judge issued a restraining order barring AK/NOT-trained chiropractors from promoting or using the techniques for the treatment of learning disorders (Russan 1987).

Del Norte Study: A Controlled Plan?

To ensure reliable, reproducible results in clinical experiments and studies, a control group is selected. Controls remove, to the extent possible, the inevitable bias of both the subject and the investigator, isolate the procedure or medication, and provide carefully defined subject groups of adequate size to make statistical comparisons. The Del Norte study design is suspect on at least two counts: setting ineffective controls on the study population variables and observer bias.

"They were applying such tremendous pressure to Donald's skull that their bodies would just shake with the force of the exertion. All during this so-called treatment Donald was screaming and struggling."

Defining the study population. As discussed above, the difficulties inherent in identifying subgroups within the general learning-disorder population for treatment or research purposes are substantial. Experimental designs must be carefully conceived and executed to ensure that a specific target population is represented in the sample groups and that matched control groups (e.g., for age, IQ, sex, etc.) are properly selected.

The Del Norte study failed on all counts. It made no attempt to identify and limit subjects to any particular subgroup of learning disorders. In fact, it included a wide spectrum of conditions, including children with Down's syndrome, cerebral palsy, and epilepsy. This, along with the failure of the study design to include a control group receiving a placebo therapy, made it virtually impossible to make statistical comparisons to determine the effectiveness of the AK diagnostic and NOT intervention procedures for various subtypes of learning disorders.

Observer bias. In the design of a study of this type, pre- and post-test measures of the variables (e.g., reading level, neurological integrity, etc.) predicted to change as a result

of the intervention phase must be uniformly applied under standard procedures. An important aspect of the data-gathering process is that the investigator making the post-assessment evaluations be unaware of the intervention given to each study subject. It has been repeatedly shown that there is a natural, subconscious tendency for an investigator to bias the subject's response or his own interpretation of the response when he has prior knowledge of the subject and the intervention given (Ballintine 1975). In the Del Norte study, for example, one measure to be used to gauge the NOT treatment's effectiveness was a pre- and post-intervention neurological screening conducted by the school nurse. Since the nurse was aware of the student's therapy during the study, her bias (positive or negative) will make the neurological data suspect. On other data sheets, such as the Visual-Auditory Digit Span test, the district psychologist (and project director) is identified as the examiner in both February and June.

Ferreri proposes a curious method for neutralizing investigator and subject bias and offers the following directions: "First, the testing doctor should be in neutral mentally and physically (that is, with no presumption as to the outcome of any test procedure), and breathing normally. He/she should be unswitched. Always test your own K27 switching circuit!" (Ferreri 1984b:32). For those not familiar with this "switch," he explains that the K27 is "the master anterior switch on the body. This is the meeting point of all the associated (spinal) points of the Acupuncture meridians and the meeting of Yin and Yang; this can be done with the umbilicus for specific side of fault, but works just as well using only both K27s." Ferreri continues: "All switches are fixed with a heavy rubbing, and should be clockwise or across, but not counter clockwise rub" (Ferreri 1984b:35). It is obvious that this does not represent a rational, proved approach for controlling subject or investigator bias.

Science or Quackery?

Given all the factors discussed, the Del Norte study and the AK/NOT treatment procedures are seriously flawed. In my opinion, the study will never be accepted for publication in a refereed journal; but, unfortunately, the Del Norte School District and this study itself will be cited by promoters of the AK/NOT program throughout the world to support the marketing of this questionable approach to the treatment of learning disorders and neurological disease.

Frank Young (1988), Commissioner of the U.S. Food and Drug Administration (FDA), defines quackery as "the commercialization of unproven, often worthless, and sometimes dangerous health products and procedures" (p. 12). In my opinion the Neural Organization Technique, applied kinesiology and craniopathy all meet these criteria. The current status of the AK/NOT model was succinctly stated by a state licensing board that suspended the license of an AK/NOT-trained chiropractor for five years: "[The] Texas Board of Chiropractic Examiners cannot condone claims dyslexia can be effectively cured through NOT or other unproven techniques. These claims are beyond that which is reasonable and commensurate with the documentation available" (Hartung 1987).

Is the Del Norte experience an isolated case of naiveté on the part of parents and a school district? Although statistics are not available on the extent of education-related health fraud, in a national survey com-

missioned by the U.S. Food and Drug Administration in 1986, Louis Harris Associates found that 1 in 4 Americans use questionable treatments and the majority of them have at least some college education (Young 1988). In fact, college graduates were the subgroup most likely to rely on questionable therapies. This translates into 46 million people. According to Commissioner Young of the FDA, that figure may seriously underestimate the full extent of the health-fraud problem. Parents agonizing over a child's struggle with the educational process often abandon reason and turn to questionable practitioners. As one parent (Eberwein) recalls, she signed the Del Norte Study consent form when school officials told her the Ferreri treatment had cured other dyslexic children with minimal pain. "Naturally, as any desperate parent would do, I leapt at the chance to do something that could possibly benefit my son."

Research involving subject groups drawn from school settings is essential for the meaningful investigation of learning disorders. A human subjects committee serving a school district has a special public trust to ensure that proposed research involving children is safe and represents a reasonable, rational approach to the problem in question. By learning from the example of the AK/NOT study and the application of the simple, common-sense guidelines presented here and in other publications dealing with the subject of questionable health practices in education (Silver 1987; Worrall 1989, 1990) parents and school districts can ensure that their limited resources are judiciously utilized to advance our understanding of the learning process. They provide parents and schools with the essential tools to evaluate alternative theories and therapies.

Treatment or Torture?

Linda Renau, a parent, vividly recalls her son's last treatment. In a letter to the California Board of Chiropractic Examiners she says: "My heart is ripped into pieces" and goes on to describe how the doctor "was pushing in Victor's eye sockets when suddenly my son (who had never had a seizure before) had some type of seizure. His right arm went out of control up into the air and in a circular type motion fell limply hanging off the table. At the same instant, his eyes rolled up and back into their sockets." Another mother, Jeannie Reitterer, who had two children in the Del Norte study, states: "My kids were guinea pigs in a torture chamber. And all I feel now is guilt."

Note

1. Much of the background information and firsthand accounts incorporated into this paper were provided by Joan Hayes, a special-education teacher, Don Major, a substitute teacher, and Theda Major, a kindergarten teacher, of the Del Norte Unified School District in Northern California, and parents Mary Eberwein, Linda Reneau, and Jeannie Reitterer.

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The Spooks Of Quantum Mechanics

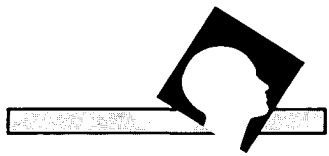
VICTOR J. STENGER

I cannot seriously believe in [the quantum theory] because it cannot be reconciled with the idea that physics should represent a reality in time and space, free from spooky actions at a distance.

—Albert Einstein

The "spooky actions at a distance" that so disturbed Einstein about quantum mechanics have provided comfort to those who seek a scientific basis for spooky things like telepathy and faster-than-light communication. For some, they have also confirmed the holistic notion that everything that happens in the universe is simultaneously connected to everything else.

Do paranormalists and holists have a right to be comforted, or are they just whistling in the graveyard? I'm afraid that they would have been better off if things had turned out not quite so spooky. As we will see, the conventional interpretation of quantum mechanics, disputed by Einstein but triumphantly confirmed by experiment, provides no mechanism for psychic phenomena or simultaneous connections between events. On the contrary, paranormal phenomena violate the foundational principles of twentieth-century physics—relativity and quantum mechanics. These principles are confirmed by countless empirical tests, having withstood every challenge scientists and pseudoscientists have been able to mount.



Quantum effects are indeed weird and spooky, but do they provide any mechanism for simultaneous connection between events or for extrasensory channels of communication?

Einstein's unhappiness with quantum mechanics is legendary, though his photon theory of light contributed mightily to the quantum revolution. In the seventeenth century, Isaac Newton proposed that light was

material, or "corporeal," in nature. By the nineteenth century, however, the wavelike behavior of light led scientists to largely dismiss Newton's corpuscular theory in favor of the wave theory first proposed by his contemporary Christian Huygens (1629-1695).

In 1905 Einstein built on Max Planck's five-year-old idea that light occurs in discrete bundles, or "quanta," and resurrected the corpuscular theory in an updated form. He proposed that light was composed of localizable particles he called "photons." Today it is unquestioned that light consists of discrete quanta—a fact daily confirmed in thousands of laboratories.

Empirically, light exhibits the discrete and local properties associated with particles. But the wave characteristics of light, such as its apparent ability to pass simultaneously through several openings separated in space, are also confirmed.

This type of schizophrenic behavior is not confined to photons alone. Electrons, neutrons, and other entities that normally appear as localized particles also can't seem to decide whether they are really particles or waves. It all depends on what you try to measure. If you look for localized electrons, neutrons, or photons, you find them. If, on the other hand, you set up an experiment designed to measure wave properties, you find these too. This wave-particle duality, exhibited by normal matter as well as light, is precisely what gives quantum mechanics its spooky nature.

In his 1905 special theory of relativity, Einstein emphasized a feature of scientific method that was to become a key to the development of quantum mechanics: physical quantities are defined by the way they are measured. This reliance on measurement was consistent with the "logical positivism," school that had been developing in philosophy at about the same time. Positivism held that the only reality was empirical observation. Metaphysical notions were nonsense, since they dealt with concepts that had no empirical content and so could not be tested observationally.

Today logical positivism is out of fashion, but any new philosophical system must still confront the question of how to make meaningful statements about the universe that are not directly related to empirical facts.

Although Einstein had provided the greatest impetus to the positivist view of nature, he later backed off considerably, insisting that physical properties must have an intrinsic reality beyond their mere measurement. This change of heart was the result of his development of the general theory of relativity, first appearing in 1916, in which space and time seem to have intrinsic holistic reality.

The Copenhagen Interpretation

Positivism in physics was instead championed by Niels Bohr, Max Born, and others of the Copenhagen School. The Copenhagen Interpretation of quantum mechanics, which is widely accepted by most physicists today, holds that an object does not even possess certain properties until those properties are measured.

When we observe anything in the universe, we must interact with the object being observed, disturbing it in some way. This presents no problem for large objects, like the moon and most bodies in our everyday experience, which hardly recoil under the action of the photons we bounce off them from the sun or artificial lights. However, at the atomic and subatomic level, photons can wreak havoc with

the system being observed. For example, since the position of the electron inside an atom cannot be measured without destroying the atom, the Copenhagen Interpretation holds that an electron has no definite position in an atom.

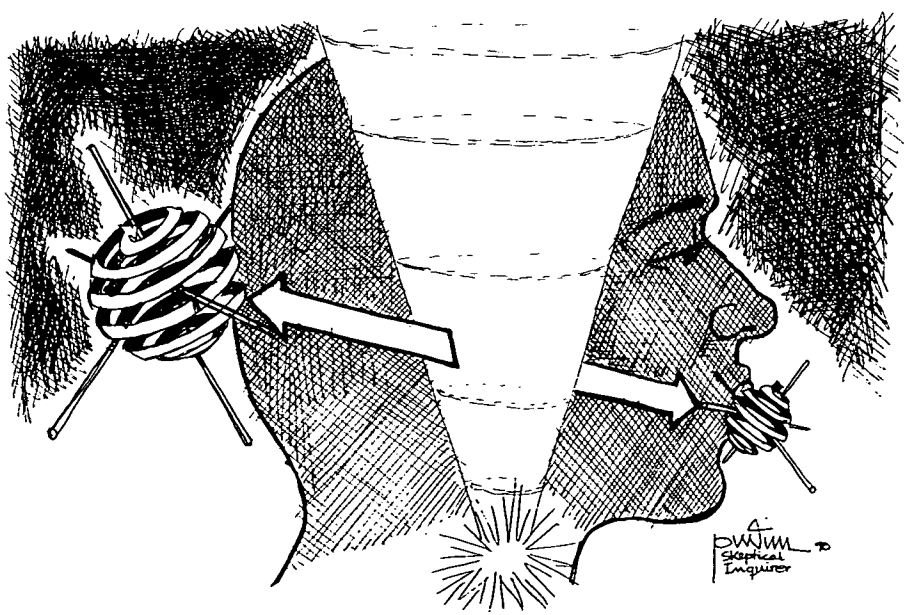
Extending this idea to all other physical quantities, we conclude that they become real only upon their being measured. Now this may sound like ancient Hindu idealism, with everything in our heads, or the New Age: "Reality is whatever you want it to be." The fact that reality rarely is what you want it to be is the best evidence that a world beyond our heads does indeed exist!

However, the reality that concerns me here is specifically that of *physical quantities:* variables used in describing observations, such as space, time, mass, and temperature. According to the Copenhagen Interpretation, these are simply human inventions—defined according to the way they are measured.

Another important element of the Copenhagen Interpretation of quantum mechanics is that the equations of physics do not allow you to predict the movement of an object from one place to another with complete certainty—only the *probability* of this movement. This probability is expressed in terms of a purely mathematical quantity called the "wave-function."

The idea that the motion of individual bodies is at least partially undetermined by what happened before contradicted the assertion of Newtonian mechanics that all motion is in principle completely predictable, provided you have sufficient information to make the calculation. By contrast, the equations of quantum mechanics only allow you to predict the *average* behavior of *similarly prepared* systems, not the exact behavior of the individual systems themselves.

Shortly after the development of quantum mechanics, the discoverer of the wave-particle duality, Louis de Broglie, proposed that particles were guided by pilot waves and that these



were responsible for the observed wavelike behavior of electrons and other particles (de Broglie 1930). He associated the quantum mechanical wavefunctions with his pilot waves.

In his 1951 book *Quantum Theory*, David Bohm developed the de Broglie idea further, proposing that some form of hidden variables may exist that provide for a more complete description of nature than conventional quantum mechanics—more complete in the sense that the statistical nature of quantum mechanics is replaced by underlying deterministic principles. The hidden variables would be analogous to the forces and potentials of classical physics that are responsible for the motion of bodies (Bohm 1951; Bohm, Hiley, and Kaloyerou 1987).

The EPR Paradox

Back in 1935, Einstein and two junior colleagues, Boris Podolsky and Nathan Rosen, had written a paper arguing that quantum mechanics must be "incomplete" in its description of reality. They argued that certain quantum systems, such as those composed of two particles, can be prepared in such a way that the result of a measurement of one particle fixes the result of a measurement of the second—before the second measurement is performed. This can happen after the particles are so separated in space that communication between them would require a signal traveling faster than light.

Einstein and his colleagues concluded that either particles intrinsically possessed certain properties before they were measured—in contrast to the quantum idea that the act of measurement brings that property into existence—or a nonlocal "spooky action at a distance" force was in effect. This has become known as the "EPR Paradox" (Einstein, Podolsky, and Rosen 1935).

Two basic concepts must be understood before we can come to grips with the EPR Paradox: (1) *reality* and (2) *locality*. Here's how Einstein and his colleagues defined reality for the purposes of their discussion: "If, without in any way disturbing a system, we can predict with certainty (i.e., with probability equal to unity) the value of a physical quantity, then there exists an element of physical reality corresponding to this physical quantity."

Clearly, the concrete objects of our everyday experience contain this property of reality—predictability. If we look away from a tree, we can predict with great certainty that it will still be there when we look in that direction a few moments later. Dreams and fantasies do not exhibit predictability.

To explain the EPR Paradox, we also have to define precisely what we mean when we say that two events are local. This can occur even when the events are separated in space. If we can find another reference frame, any reference frame, in which the two events occur at the same place, we are forced to conclude that the events are *local* since our descriptions cannot depend on any one point of view. In this case, no "action at a distance" between events has taken place.

Before Einstein and relativity, scientists believed that no limit existed on the speed of bodies. Thus, whatever the separation of two events in space and time, it was always possible to find a reference frame in which the events were local.

However, if Einstein is correct, then there must exist certain events that cannot be made local in any reference frame—because any signal passing between them must exceed

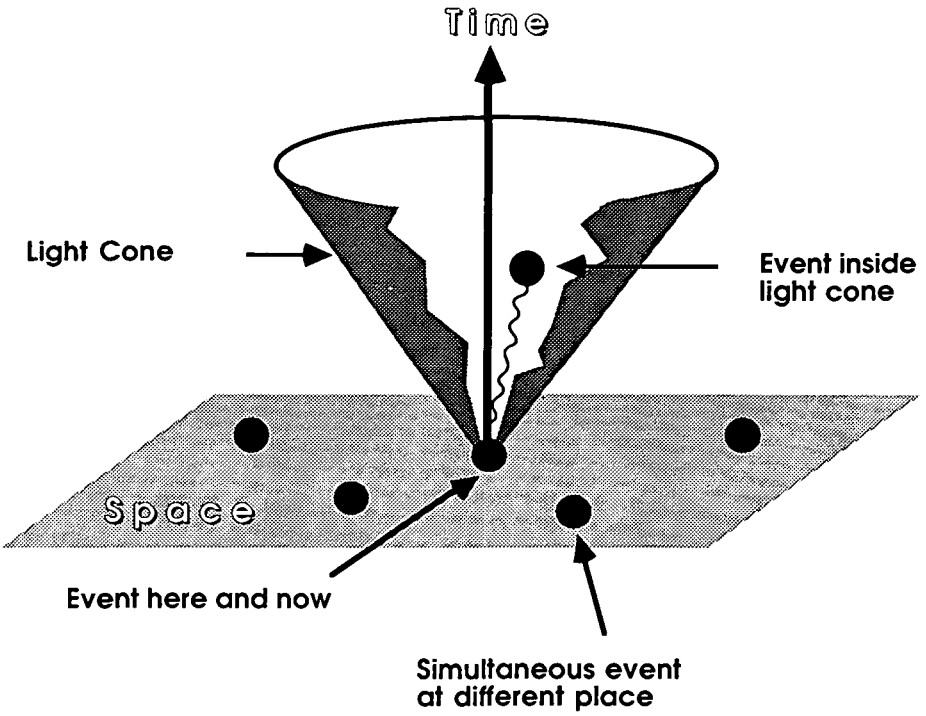


FIGURE 1. Representation of events in space and time. For illustration, space is indicated as a two-dimensional plane, with the time axis vertical. An event occurring "here" and "now" is indicated at the base of the time axis. It can only be causally connected to events inside the light cone. To reach an event outside the light cone, a signal must travel faster than the speed of light. Simultaneous events at different places cannot be connected, since they lie outside the light cone.

the speed of light. In relativity jargon, such events are said to be "outside the light cone." (See Figure 1.)

The "spooky actions at a distance" that concerned Einstein were apparent causal connections between events that lay outside the light cone. According to relativity, there must exist phenomena in the universe that are independent of one another—namely, those events that are outside the light cone. No interaction between these events can take place. An important special set of events outside the light cone are those occurring simultaneously at different places. Simultaneous events that are separated in space cannot affect one another in any way. (See Figure 1.)

This is a point that hardly anyone, and not many scientists, recognize: *Holism violates Einstein's relativity.* If simultaneous holistic connections between separated events exist, then either the whole foundation of twentieth-century physics must be destroyed or these connections must be supernatural—they must be *miracles.*

In his 1951 book, David Bohm speculated that "no theory of mechanically determined hidden variables can lead to *all* of the results of quantum theory." He proposed an EPR-type experiment involving electron spins that would much later provide the conclusive test (Bohm 1951).

Bohm's proposal exploited the

remarkable properties of the elementary quantity called *spin:* the intrinsic angular momentum of a particle. Spin is a vector with components along each of the three axes of space: x, y, and z. According to quantum rules, however, only one of its three components can be measured at a given time.

Measuring a second component of spin results in a change in a subsequent measurement of the first. It's as if you measured the height of a woman and found it to be 5 feet, 4 inches, then measured her waistline, and then went back and measured her height again and found it to be 4 feet, 5 inches.

Bohm suggested the following experiment: Suppose you start out with two electrons in a certain state in which the total spin is zero, the so-called *singlet state.* Then let the electrons go off in opposite directions. (See Figure 2.) After they have separated some distance, measure the spin component of one electron along a particular axis, say the z-axis. Since total angular momentum is conserved, the total spin of the two-particle system must remain zero, even as the particles become separated.

As a result, the measurement of the z-component of the spin of electron A immediately fixes the z-component of the spin of electron B. And so, in the EPR sense, the z-component of spin corresponds to "an element of physical reality," since you can predict with absolute certainty the outcome of a measurement of electron B.

But what about the x- and y-components of the electron's spin? In classical physics, all three components are intrinsically real, as presumably are the three components of the angular momentum of the earth. The electron simply carries along these properties as it moves from the source to the detector, just as it carries its mass and electric charge. However, conventional quantum mechanics says that only one spin component can be real at any given time, specifically, the last one measured.

In the case of the Bohm experiment, the experimenter at the end of one electron beam measures the spin component along some arbitrary axis. This act determines, with 100 percent certainty, the outcome of the measurement of the spin component *along the same axis* at the end of the other beam. The two measurements could happen at a sufficiently large separation and small time interval to be outside the light cone. Somehow the information that the first electron's spin has been measured is transmitted instantaneously to the second. Thus, Bohm's experiment seems to demonstrate Einstein's "spooky action at a distance."

One point should be filed away for future reference: Note that the second measurement must be along the same axis as the first. Measurements of the spin along any other axis are not predictable with 100 percent certainty, so the second observer must know ahead of time what axis to use.

Several types of hidden variables are possible, but let me focus on the type that is consistent with our own intuitions carried over from classical physics: hidden variables that are both real and local.

Real, local hidden variables (1) connect events in space only within the light cone and (2) have intrinsic reality that we can take to be defined in the EPR sense. If the three components of spin are all real, then at least two of them must be hidden variables, since all three cannot be simultaneously measured. In conventional quantum mechanics, they are not hidden; rather, they are *not real,* because only measurement makes a variable real.

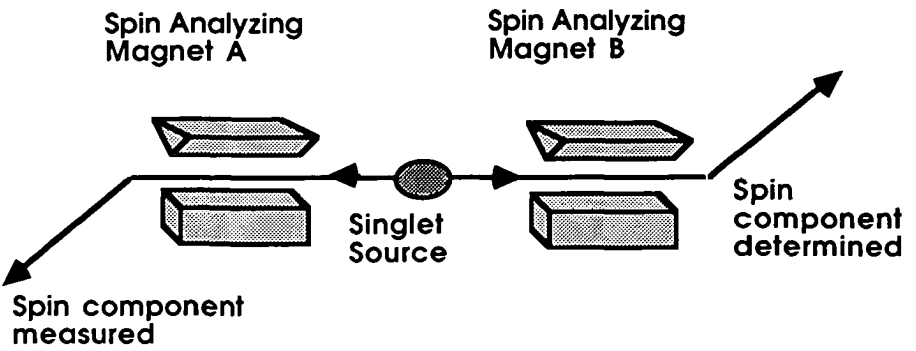


FIGURE 2. The EPR Paradox experiment proposed by David Bohm. Electrons from an initial singlet (total spin zero) state are analyzed by magnets that are oriented to deflect the particles one way when they are spinning along a particular axis, and the opposite way when they are spinning opposite. Once the spin component at one end is measured, the component at the other end is determined. In conventional quantum mechanics, spin components do not exist until they are measured.

The hidden variable interpretation implements the traditional notion that reality goes beyond measurement. Which interpretation do you prefer? The spooky one of Bohr and Born or the sensible one of Einstein, de Broglie, and Bohm? How can we decide? The same way we decide anything in science—by experiment.

Bell's Theorem

In 1964, John S. Bell analyzed Bohm's proposed experiment and was able to prove that it provided a practical means for distinguishing conventional quantum mechanics from real, local hidden variables theories. Basically, Bell showed that the quantitative correlation between measured spin components of the two electrons from a singlet source, as computed from quantum mechanics, is greater than would be possible in any theory of real, local hidden variables (Bell 1964; Clauser and Shimony 1978; d'Espagnat 1979; Redhead 1987).

At least a dozen experiments have been developed to perform the tests provided by Bell's theorem. The definitive series was done by Alain Aspect and his collaborators at the Institute for Applied Optics of the University of Paris, Orsay, France (Aspect, Grangier, and Gerard 1982).

Bohm's proposed experiment involved electrons, but photons provide an equally powerful test since they too have spin. In the Orsay experiments, a singlet (spin zero) atomic source emits pairs of photons in opposite directions. Thus, when one photon is later measured to have a spin component along a particular axis, the other photon will have the opposite spin component. Conceptually, the experiment is similar to the simple one illustrated in Figure 3.

Each beam passes through polarizers of variable orientation around the beam line, and then into photomultiplier tubes capable of counting individual photons. A different polarizer orientation is randomly chosen for each pair emitted from the source. In an advanced version of the experiment, the Orsay experimenters arranged it so the choice of polarizer orientation was made after the photons left the source. This provided an unambiguous test of Einsteinian locality, since in this case no signal

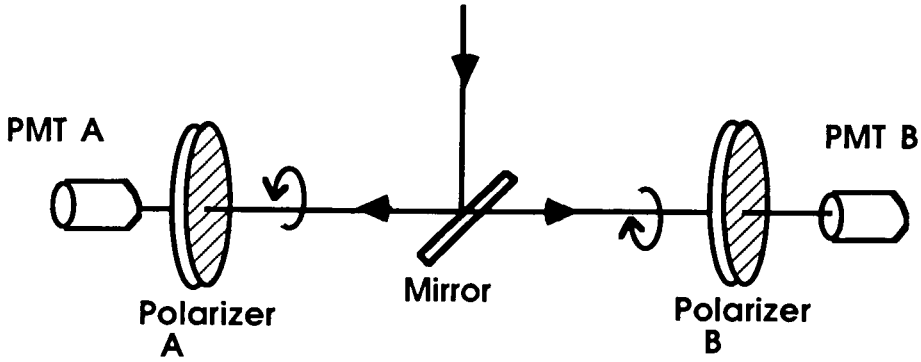


FIGURE 3. Conceptual equivalent of Aspect experiment. The mirror splits a light beam into two right circularly polarized beams. The beams pass through polarizers before being detected by photomultiplier tubes (PMT).

could pass between the ends of the beams without traveling faster than the speed of light.

Using photomultiplier tube detectors, the experiment counted the number of photons for each relative orientation of the polarizers at the ends of the two beams. From these counts, the experimenters could determine the amount of correlation between the settings at the end of one beam and the other.

The results of the Aspect experiment showed greater correlations between polarizer orientations than were possible if all three components of the spin of each photon were intrinsically real, as defined by the EPR criterion. This empirically demonstrated that the spin components of photons cannot be both local and real. Furthermore, the measured, quantitative correlation agreed precisely, within very small experimental errors, with that calculated using conventional quantum mechanics. Quantum mechanics emerged triumphant.

But this also meant that we still had spooky action at a distance. Measurements at the end of one beam seem to determine measurements at the other, within time intervals so small that any signals between the two would have had to exceed the speed of light. Is this a possible mechanism for ESP and other psychic effects? Some have claimed so (Sarfati 1977; Herbert 1985; Targ and Puthoff 1977).

Let us see if an EPR device could be built to provide a means of superluminal signaling. Suppose we have a singlet source that sends the photons of each pair in opposite directions, as in Figure 3. At the end of both beam lines we have photomultiplier tubes that can count the photons emerging with polarizations at any angle in a plane perpendicular to the beam lines, as determined by the polarizer rotation angles about the beam axes.

When the settings at both ends are the same, the spin component at one end is completely determined by the setting at the other. Thus it seems that we should be able to use this fact to signal from one end of the beam to the other, instantaneously over great distances.

But it turns out we can't! In order to communicate information from one point to another, a series of bits encoding a nonrandom message must be transmitted. Leaving both polarizers at the same angle provides for no information transfer. The photomultiplier will simply find half of the photons polarized in the selected

direction, and half in the opposite direction, in random distribution.

To encode and decode messages, the polarizer angles of both sender and receiver must be changed. Now the observer at the end of the receiving beam line cannot know ahead of time what angle to use—that information must be contained in the coded message the observer would receive. So the receiver would have to randomly change the polarizer angle and then try to extract the message from the number of received hits at each angle.

One might be inclined to think that this is possible, given the fact that the measurement of a photon or electron at one end determines the outcome of a measurement of the other member of a singlet pair. But it simply does not work out that way. Remember, 100 percent certainty only occurs when the axes used at both ends are the same.

With each angle setting of one polarizer, a specific, calculable distribution of photons will be found for each setting of the other. In fact, the relative numbers of photons observed at each setting will exactly trace the intensity patterns calculated from classical optics for an experiment with circular polarized light, obeying Malus's law discovered two centuries ago! It follows that the bit sequence formed by the individual photon counts at the receiving end will have no information content. As in the case of fixed predetermined settings, the bit pattern will be purely random. No signal transmission is possible. (For a more detailed analysis of the information transferred in an EPR apparatus, see Mermin 1985.)

The experimental violation of Bell's inequality leads to a clear and unequivocal conclusion: nature cannot be described in terms of hidden variables that are both local and real. Either Einsteinian locality or certain commonsense notions of reality must be discarded. There is no third alternative.

Most popular writers prefer to discard locality rather than reality (see, for example, Herbert 1985). They cannot understand why physicists are so unwilling to give up locality. My answer is simple. We have no reason—indeed, no right—to do so. Einsteinian locality is completely consistent with everything we know about the empirical world, from the nineteenth-century experiments that failed to find the ether to the tests of Bell's inequality. We have just seen that the apparent spooky action at a distance of quantum mechanics does not provide for superluminal transfer of signals, and so does not violate Einsteinian locality. The only violation of locality occurs within the imaginary framework of our own descriptions of the observations. The wavefunction is nonlocal, but it is also nonreal.

Abiding by Occam's Razor, the more economical hypothesis is to deny the intrinsic reality of physical observables. Now, at first blush, this may not seem very economical. I appear to be making the most drastic of hypotheses. This guy is doing away with reality!

But actually I am being completely economical. I have, in fact, introduced no new hypotheses beyond those already implicit in relativity and quantum mechanics. To toss out locality and demand reality, we make two unacceptable and unnecessary, drastic hypotheses: that the two pillars of twentieth-century physics, relativity and quantum mechanics, as conventionally interpreted, are wrong. I would rather assume they are right, since they have been confirmed repeatedly, including by the experimental tests of Bell's theorem.

I am not denying the existence of

an underlying reality. I agree that the moon is there when no one is looking at it. I simply argue that the true reality of the universe is not necessarily manifested by objects possessing attributes, such as position and mass, that we assign them in the process of doing physics. These variables, after all, are human inventions with no precisely definable meaning beyond their measurements as performed with specific instruments like clocks and meter sticks.

Describing nature in terms of physical variables is like sketching or photographing an object. Isn't it rather foolish to equate images on a piece of paper with the real thing? We laugh at those ignorant and superstitious people who stick pins in dolls and think that this will harm the person represented. Yet even the most sophisticated physicists ascribe a kind of voodoo reality to their own mathematical images. Quantum mechanics is not voodoo, despite what books on the occult shelves of bookstores say.

No Support for the Paranormal

Paranormalists are dead wrong when they claim that modern physics supports their proposal of extrasensory channels in some kind of underlying ethereal reality. The opposite is true. Einstein's relativity destroyed the continuous ether and the instantaneous connection between events. Quantum mechanics destroyed the notion of continuous matter and energy. Twentieth-century science provides a picture of a universe of discrete material objects, interacting with each other within the light cone, with nothing further required by any existing data.

Quantum mechanics does not provide a mechanism for supersensory phenomena. Experiments fully support the conventional statistical interpretation of quantum mechanics, with the nonlocal and nonreal wavefunction describing ensembles rather than individual particles.

Quantum effects are certainly beyond normal experience. They are weird. But it does not follow that every weird idea is consistent with quantum mechanics.

Further Reading

An excellent lay discussion of EPR, Bell's theorem, and the experiments designed to test them can be found in the *Scientific American* article by d'Espagnat (1979). I also recommend Mermin's article in *Physics Today* (1985). A more rigorous and very complete review is given in the *Physical Review* paper by Clauser and Shimony (1978). A full philosophical discussion of these issues can be found in the book by Redhead (1987), and the opinions on the subject of many prominent people have been collected by Davies and Brown (1986). An English translation of d'Espagnat's *Reality and the Physicist* has just become available (1989). Other skeptical critiques of paranormal applications of quantum theory have been given by Shore (1984) and Gardner (1983, 1985).

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Science and Sir William Crookes

STEVEN HOFFMASTER

One of the current arguments being waged among those who teach physics is that of content versus process. This is not a new debate. In fact, it reappears every 20 to 25 years. In essence, one side says that it is more important to know how to think and reason scientifically than to have one's mind cluttered with excessive minor laws and physical principles. It is necessary to know examples of the major laws, but we need not know tens or hundreds of examples of them. Through analogy we can infer behavior from one field into another. For example, knowledge of electromagnetism leads to an understanding of optics, and if we know elementary mechanics, fluids need not be covered in exhaustive detail.

The other side counters that we cannot understand process without some background and knowledge to draw on. First you have to know the facts, and only after that can you make useful analogies and inferences. Without this background knowledge, we are playing games in the dark. Process is nice, but it cannot be done in a vacuum.

Such a tension typically exists in all of the sciences. Clearly both sides have merit. I offer here a partial solution to this dilemma. In so doing, I hope to demonstrate an effective way to convey the thought processes of science and at the same time to present the human side, foibles and all, of science and scientists.

It is often said that we learn from our mistakes. As a corollary, it could be argued that we might be able to learn a great deal about science by observing what it is not. We might learn process in science by looking at pseudo-science. There are many possibilities here. I will limit myself to just one example, Sir William Crookes.

The psychic adventures of an eminent scientist reveal some of the processes and limitations of science as well as its human side, foibles and all.

By analyzing the scientific ventures of Crookes as well as his sojourn into the paranormal, I believe we can see many things that have relevance to us today. We can learn scientific process by observing where Crookes might have gone wrong. We can learn the human side of science by looking at why and how he went wrong. And we can, by analogy, develop a system that will allow us to, at least initially, sift through many of the seemingly scientific claims that bombard us today. And we can accomplish this without attacking strongly held current beliefs or lifestyles. Contemporary pseudosciences can be evaluated by analogy with Crookes's efforts and results.

I shall not dwell on the life and accomplishments of Crookes. Nor will I spend much time on his paranormal adventures. My purpose is to emphasize the contemporary lessons to be learned from his life. However, some background will be necessary to clarify and justify the conclusions.

Crookes as Scientist

William Crookes was born in London in 1832 into a middle-class family. He was his parents' first child and would eventually have 15 brothers and sisters. At the age of 16, after what can best be described as an irregular education, he attended A. W. Hoffman's Royal College of Chemistry, in London. There he was Hoffman's personal assistant for four years and was introduced to a number of well-known scientists. Chief among them was Michael Faraday, the experimental physicist. Crookes himself would become a premier experimental chemist and physicist and an excellent lecturer, and yet he would remain rather naive mathematically.

In analyzing the spectrum of impure selenium, Crookes saw a bright green line that would eventually lead to his isolation and identification of the element thallium in 1861. In the 1870s Crookes both built and did extensive research on radiometers, devices that rotate in a sealed container when illuminated. Also in the 1870s Crookes began studies in the field of low-pressure (vacuum) physics. He would couple this with investigations of radiation. Together these would lead to the building of a cathode-ray tube, more often simply called a Crookes tube, which for all practical purposes is still the prototype for modern-day creation of X-rays. His studies of radioactivity would continue, productively, into the 1900s.

The chemist and physicist Sir William Crookes circa 1900 (sketch, from photograph, by Tim Harris).

Largely because of his scientific accomplishments, Crookes was knighted in 1897. His entrepreneurial skills enabled him to be reasonably well off financially his entire life. Hence he was able to function much more independently of the demands

of organized scholarship and academic bureaucracy than many other scientists of the time (d'Albe 1923).

Experiments with Home and Cook

Although his scientific accomplishments were exceptional, Crookes would not be nearly as well known today if it were not for his efforts outside traditional chemistry and physics. It is difficult to date exactly when Crookes's interest in Spiritualism began, but it is certain that by 1867 (when his brother Philip died) he was active in such matters. Spiritualism in England had been established by 1860 as an alternative to fundamentalist Christianity (Gauld 1968). Many others in the scientific community showed interest in the movement. Their number included Faraday, Lodge, Wallace, and Rayleigh. Here we will concentrate on the years 1870 to 1874, when Crookes entered the world of psychical research full time, with his typical dedication to experimental detail.

There have been many excellent summaries of Crookes's efforts during these years (Brandon 1983; Hyman 1985). I will describe only a few of his experiments to show their general tone and scope. (For more detail, an excellent source is Crookes's own summary of these ventures [Crookes 1874, 1904]. It is fascinating to see what Crookes mentions and what he omits in his summaries of the experiments.)

With his usual tenacity Crookes decided that he would provide the conclusive proof of the existence of spiritualist phenomena. He would do this experimentally and he would of course be meticulous and thorough. The best mediums would be examined as they held their séances, and the experimental results would speak for themselves. The mediums studied by Crookes included D. D. Home, Florence Cook, Kate Fox, and Eva Fay. When Crookes felt that he had been deceived, his criticism was merciless. He was equally adamant, at least initially, about those mediums he felt to be genuine. Home and Cook are the two best examples of the latter group.

Daniel Dunglas Home was the most successful of the British mediums. He was never caught red-handed in an overt deception. Crookes conducted a series of investigations on Home in 1870 and 1871. Any summary of these experiments unfortunately of necessity would leave out many interesting details. I hope that mine is, at least, representative of what transpired between Crookes and Home.

An example of one of the early experiments is shown in Figure 1. This involved Home being requested to have the "spirits" play an accordion. As the figure shows, Home held an accordion inside a basket that was placed almost completely under a table. There was only enough room between the basket and the table for Home's arm. Associates of Crookes "monitored" Home's feet and his other hand. Part of the report on this experiment went as follows:

> . . . The accordion was seen by those on either side of Mr. Home to move about, oscillating and going round and round the cage, and playing at the same time. Dr. Huggins [a scientific associate of Crookes] now looked under the table, and said that Mr. Home's hand appeared quite still whilst the accordion was moving about emitting distinct sounds.
>
> Mr. Home still holding the accordion in the usual manner in the cage, his feet held by those next to him, and his other hand resting on the table, we heard distinct and separate notes sounded in succession, and

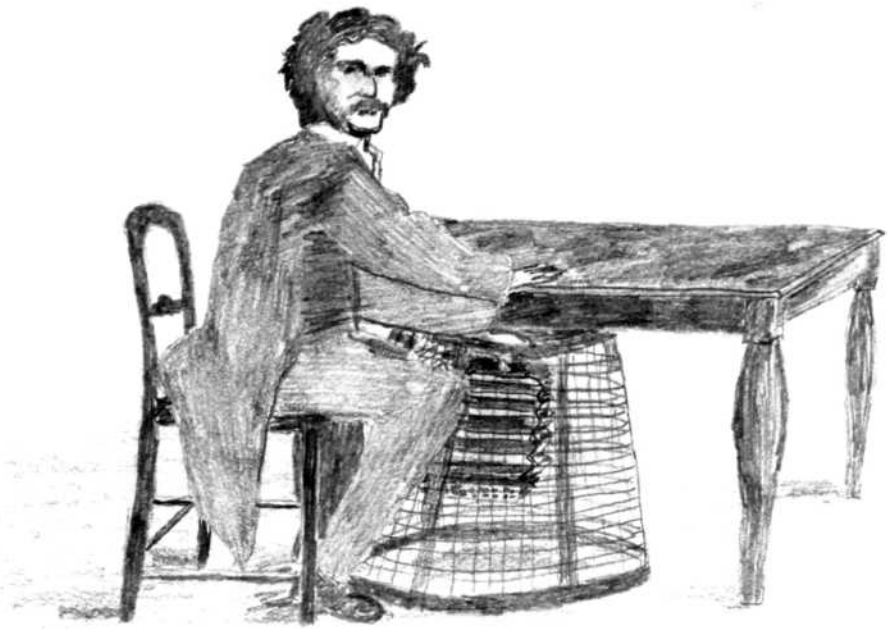

FIGURE 1. The accordion experiment with D. D. Home (sketch, from photograph, by Tim Harris).

> then a simple air was played. As such a result could only have been produced by the various keys of the instrument being acted upon in harmonious succession, this was considered by those present to be a crucial experiment. . . . (Crookes 1874)

It might be mentioned at this point that the experiment described apparently took place in Crookes's home. And although much of the information given by Crookes is useful, some of it is vague (the room was illuminated by gas—how well?) and some is irrelevant (the temperature fluctuated between 68 and 70 degrees Fahrenheit). There were many subsequent tests of Home. Some of the best electrical equipment of the day was used in an effort to monitor Home's movements. Reasonably elaborate springs and lever systems were set up to measure forces on any object that the spirits might move. Excruciating detail is usually provided.

The experiments with the medium Florence Cook were decidedly less controlled than those with Home. A representative of Florence Cook contacted Crookes in 1874 and requested that he "investigate" Cook and her psychic abilities. It is interesting to note that in late 1873 she was involved in a rather unpleasant situation. While she was holding a séance, a spirit, "Katie King," materialized and was moving about in the séance room. "Katie" was seized by a Mr. Volkmann, and it turned out that she was a very substantial entity with a remarkable resemblance to Cook. Because of this impropriety, Volkmann was attacked and unceremoniously removed from the séance room (Brandon 1983).

However, the reputation of Florence Cook was seriously impaired and a quick fix was needed. Enter William

Crookes. One of Crookes's major efforts was to show that there were two entities, Cook and King, and that they were distinct. His evidence included foot measurements, photographs, height measurements, facial marks, and hair color (Crookes 1874). In particular the photographs are unconvincing. In some of the pictures of the spirit, one can see under her white clothing the darker clothing of the medium.

After this rather brief summary let us move to Crookes's conclusion:

> . . . The almost daily séances with which Miss Cook has lately favored me have proved a severe tax upon her strength, and I wish to make the most public acknowledgement of the obligations I am under to her for her readiness to assist me in my experiments. Every test that I have proposed she has at once agreed to submit to with the utmost willingness: she is open and straightforward in speech, and I have never seen anything approaching the slightest symptom of a wish to deceive. Indeed, I do not believe she could carry on a deception if she were to try, and if she did she would certainly be found out very quickly, for such a line of action is altogether foreign to her nature. And to imagine that an innocent school girl of fifteen should be able to conceive . . . so gigantic an imposture . . . does more violence to one's reason than to believe her to be what she affirms herself. (Crookes 1874)

This is certainly an interesting conclusion on Crookes's part, particularly considering the debatable quality of the evidence. More than one associate of Crookes questioned his motives and objectivity in the Cook investigation (Hall 1963). Trevor Hall has proposed a convincing case for a romantic interlude between Crookes and Cook, while the paranormal community has been able to counterattack reasonably effectively (Medhurst and Goldney 1964). It might also be of interest to the reader to know that Florence Cook was 18 or 19 (not 15), married, and being rather aggressively promoted by her husband and mother.

With this summary in mind, what might we learn from Crookes's paranormal exploits that has current relevancy? How might we use his career as a scientist to better explain scientific process; to show more effectively what science can do and, perhaps, what it should not attempt?

There are two general observations that I wish to make. They are to a certain degree intertwined and involve the interaction between science and the paranormal. They also illustrate mistakes or misconceptions relating to the current perception of both science and pseudoscience.

Transfer of Expertise

To what degree is knowledge in one field of any value in making reasonable judgments in another? Can an organic chemist realistically be expected to comment on developments in particle physics? Both areas are certainly in the physical sciences. In the ever-more-narrow specialization of today's science, I suspect that it would be a rare individual who could do more than superficially comment on both of these fields.

This, of course, does not stop us from doing it. From my own experience, I know that one of the most irritating personal traits of many scientists is that they feel their training and education permits them to expound on many and varied topics. And to a certain degree this is true. Scientific analysis usually provides an excellent framework to begin analysis of most problems. However, in fields

where human interactions and perceptions are involved, the knowledge of a natural scientist frequently has to be supplemented rather extensively by information from other areas. Often the scientist will quickly be no better off than the untrained. Sometimes he or she may even be worse off. This usually occurs when the success of past scientific efforts builds up an arrogance or blindness that prohibits seeing inconsistencies or outright errors in current research.

The psychic researches of William

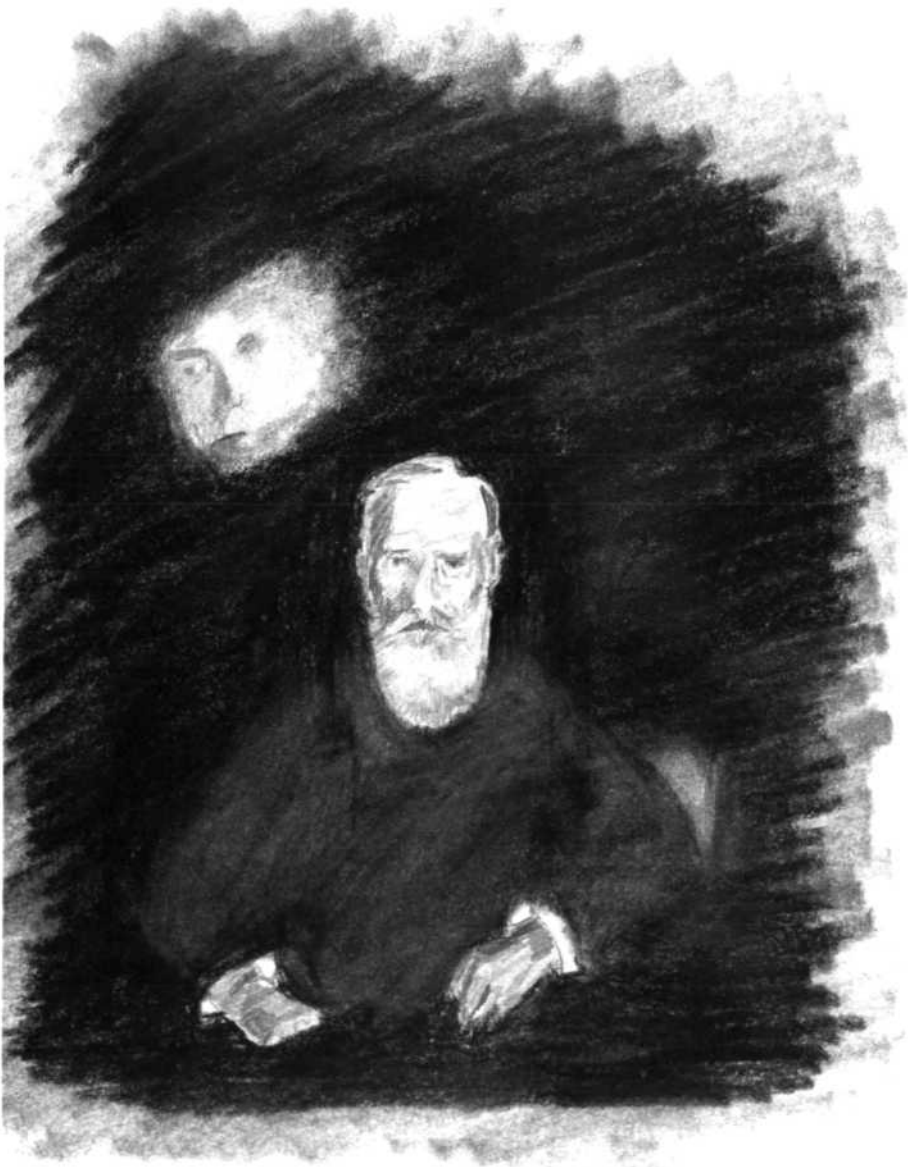

FIGURE 2. Spirit photography (1916). Is this really a picture of Sir William Crookes with his deceased wife? (Sketch, from photograph, by Tim Harris.)

Crookes show this beautifully. By all standards Crookes was a superior experimentalist. However, this expertise did him little good when he investigated the likes of Home or Cook. He was very much aware of the possibility of fraud. But he was not very well trained to seek and identify it. Probably with Home, and most certainly with Cook, he was wrong. Crookes should have been alerted by Florence Cook's recent problems to look for fraud more closely. He was not.

The readers of the SKEPTICAL INQUIRER are quite familiar with the general inability of scientists to detect fraud. Recently, however, I was attending a presentation by a noted chemist in which he ridiculed the participation of James Randi in the Benveniste homeopathy investigation in France. He further argued that only scientists should be involved with scientific matters, even fringe science. Most experience, on the other hand, shows that the presence of a good magician can never hurt (Gardner 1981; Houdini 1924; Randi 1982).

Crookes was the first scientist to give a considerable amount of his time to serious scientific investigation of spiritualism. And he came out, at least in part, in favor of its validity. His favorable conclusion was subsequently used as a background for the research of others.

An excellent example is that of Oliver Lodge, another physicist, who in the late 1890s and early 1900s wrote extensively on spiritualist matters. Lodge would consistently avoid scientific tests of mediums and séance-related affairs, claiming that Crookes had conclusively demonstrated their existence and that it would be needlessly repetitive for him to do likewise (Hoffmaster 1984). Lodge concentrated on more philosophical matters, such as a mind-matter duality and the nature of the spirit world(s).

Lodge was not alone in his use of Crookes's research. It is the rule rather than the exception to cite the work of Crookes as a validation of the phenomenon. This seems even more unusual in view of the fact that most modern researchers in the paranormal will admit that Crookes's research was seriously flawed. What one sees here is a classic example of the pseudosciences' failure to revise in light of key criticism (Radner and Radner 1982). The flawed investigations of Crookes should be used as an interesting historical reference. However, many still cite them as valid scientific research, something they clearly are not.

The performance of William Crookes in paranormal research can show quite clearly that there are limitations on both science and scientists. An explicit statement of this somewhere in one's education should not do irreparable harm.

Microcosm of the Scientific Method

One of the toughest parts of an introductory science course is teaching the scientific method. If presented in all its detail, it can be quite laborious for both instructor and student. Add a few examples of Galileo rolling balls down ramps and even the best of overachievers is hard put to maintain any interest. Perhaps just a few case studies would more quickly and effectively demonstrate the scientific method.

The psychic experiments of William Crookes are one such useful example. They represent a scientific approach to a field that is at best marginally scientific. Because of this they also indicate some of the basic assumptions and limitations of scientific investigation.

First, Crookes as a physical scien-

tist was operating within a fairly structured set of guidelines. His work was expected to conform to previous laws and principles developed within the fields of chemistry and physics. Paramount among these were the conservation principles and Newton's laws of motion. Things just do not move by themselves. There should be an expenditure of energy and the presence of forces.

Much of Crookes's work was an attempt to measure the presence and size of these forces. The elaborate levers he used at the Home experiments were ultimately attached to calibrated springs to determine the size of applied forces. Behind his work was an assumption of an orderly and consistent universe. In addition to the principles assumed above, his electrical experiments with Eva Fay and Florence Cook showed a belief that the accepted principles of electromagnetism applied to spirit investigation. Lodge would later attempt to make a case that the spirit world was beyond physical investigation, that the mind-matter link transcended the mere banalities of the material world (Lodge 1929; 1930).

Crookes in the early 1870s was not ready to make a similar statement. Although he was aware of the possibility of deception, he felt that his precautions were adequate. He had detected fraud in the investigations of Fox and Fay, but not in those of Home and Cook. He was then in a dilemma. Here were some valid observations that contradicted the conservation laws. At this point, he introduced the idea of guidance without expenditure of energy.

In my opinion Crookes had his perceptions affected by his prior training. Because of their inclinations and education, physical scientists tend to see the world differently. They look for patterns and causal relationships more than most others do. Sometimes they see them even if they are not there. Scientists are notoriously easily fooled by sleight of hand.

A scientist usually assumes that nature, although at times very subtle and intricate, is not devious and deceitful. Crookes brought his attitude with him. He knew of the probability of fraud, but he did not have the training to adequately prevent or recognize it. Science generally assumes that nature is not out to play tricks. It also assumes of nature a regular and benign behavior. These assumptions are not warranted in paranormal investigation.

Conclusion

As Lewis Jones pointed out in a recent article in the SKEPTICAL INQUIRER (Jones 1989), not all scientists think scientifically. Part of the reason for this is the way we train our scientists. In many courses a memorization and regurgitation of facts is all that is needed. Science ought to be much more than this. It is a way to analyze the world around us and is not limited to molecules and blocks on planes. It is not restricted to those with graduate science degrees.

Education is more than rote learning in a classroom, which is necessary but not sufficient. Many times what is missing, particularly in traditional science courses, is an exposure to the process of scientific thinking and analysis. All too often if this is learned, it is through some sort of osmotic process.

To my mind, the efforts of William Crookes, more than a century ago, can effectively be used as an example to convey scientific process and analysis in a way that more actively captures the student's interest. The experiences of Crookes fairly clearly show that science is a human endeavor with

its associated strengths and weaknesses. This is a valuable lesson, one often overlooked or underemphasized. Science is also exciting and rewarding. It is up to those of us who are interested in science to see that the message is conveyed. The psychic adventures of Sir William Crookes are an effective and interesting way to do this.

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The 'N Machine'

A Perpetual Motion Notion

DUNCAN G. CUMMING

According to present scientific theory, the perpetual-motion, or "free energy," machine is flatly impossible. Any number of such devices have been presented to the world in the past, but not one has really worked. In every case, the inventors either have been honestly mistaken or were knowingly perpetrating hoaxes. But supposing that a new source of energy were, in fact, to be discovered by an individual inventor, would the "orthodox scientific establishment" suppress the idea?

The answer to this question is a resounding *no*. Far from being suppressed, the new principle would be enthusiastically investigated, tamed, and exploited. Even in the unlikely event that the government tried to suppress such an invention, it would probably be no more successful than it has been in trying to suppress such things as nuclear energy secrets.

In this article I describe investigations of a possible new energy source, politely named the "Presumed Latent Spatial Energy Field." The device to use this purported energy, known as an "N Machine," was invented by an MIT graduate, Bruce De Palma (Electrical Engineering, 1958). Some nonscientists will be surprised that the scientific community displayed such interest in a concept that most physicists and engineers would reject out of hand.

In order to test an electrical machine, it is necessary to measure power levels accurately. The definition of a perpetual-motion machine requires simply that the output power exceed the input power. The scientific techniques for measuring power are well established; so it is no surprise that, when apparent power gains are reported, since the inventors usually have no formal scientific training they neglect to measure one or more factors. I have found that

A perpetual motion controversy reported by an emeritus professor at Stanford is resolved by a new experiment.

the most usually neglected items are the power factor and the crest factor, both critical to the measurement of power. Joe Newman's device is a typical example of the latter. Ignoring the crest factor, he greatly underestimates the input power to his machine, giving an apparent efficiency greater than 100 percent. The National Bureau of Standards also made some measurements on his machine. They, of course, did take the crest factor into account and found true efficiencies well below 100 percent (*SI*, 11:114-116; see also *SI*, 14:226-228). Thus Newman's "energy machine," once correct testing procedures were used, was shown to consume energy rather than produce it.

The "N Machine" is a device that seems to generate more power than it consumes when the power measurements are made by a trained scientist who does not neglect any obvious factors. It is an electrical generator first invented by Faraday in 1825, but neglected since then. Technically, it is known as a "one-piece homopolar generator." Faraday himself never measured the efficiency of such a machine, being more concerned with the basic principles of electromagnetism. De Palma decided to build such a machine and found, to his delight, that the efficiency appeared to exceed 100 percent.

Another scientist, Robert Kincheloe, was intrigued by De Palma's results and decided to repeat the experiment. Kincheloe is emeritus professor of electrical engineering at Stanford University. He found that De Palma had made the classical error of not accounting properly for the power factor in the drive motor, so he replaced it with a DC motor, which is not subject to this error. Astonishingly, Kincheloe still found that the power output exceeded the power input by a factor of four. What was going on?

I examined Kincheloe's test data to see what kind of errors might have been introduced. The input power had not been measured in the usual way with a dynamometer, but instead the electrical input to the drive motor had been measured. This was a much less accurate technique. Also, the generator was coupled to the drive motor by means of a belt drive, introducing further unknown errors. Even more serious was the considerable brush friction in the generator itself. In fact, the various losses amounted to several times the generated power under most conditions. To get around this problem, two measurements had been made, one with and one without the load. The *increase* in input power was then compared with the *increase* in output power. However, this created "ill conditioned" data and was an inaccurate technique.

Could any conclusions be drawn from these data in spite of the possible inaccuracies? I felt that Kincheloe's experiment was inconclusive regarding the "incremental power gain." However, there had been another spectacular discovery. At top speed, the electrical output was about equal to the drive motor power, in spite of the high brush-friction losses. This implied that if the friction were reduced by better design, then the output power would increase to the point where it exceeded input power. Could De Palma's speculations about latent spatial energy be correct?

In December 1987 I decided to do some experiments myself to investigate this phenomenon further. I did not want to go to the enormous trouble and expense of constructing a high-efficiency homopolar machine, and in any case it would be difficult to account accurately for all the losses in such a machine. I needed to measure

The "Sunburst N Machine" with its inventor, Bruce De Palma (*right*), and its investigator, Robert Kincheloe.

the input power and the output power, and see if they were equal, as predicted by established theory, or different, as claimed by the inventor of the N Machine. Experimental considerations made direct measurement of power very difficult in this type of machine. However, by making separate measurements of torque versus current and voltage versus speed, both input power and output power could be calculated accurately without errors due to friction and other losses. It was this dramatic improvement in experimental accuracy that permitted the first definitive evaluation of the N Machine concept. (The full experimental report is available from the author.)

I first built a scale model of the N Machine from a ceramic bar magnet with a brass disc attached to one end. While rotating this at various speeds in a lathe, I measured the generated voltages. I found that the results were both consistent from run to run and linear, as predicted by theory.

I measured the torque at various currents by suspending the model from a thin metal strip and measuring the angle through which the model rotated. (Electrical connection was made through a conducting liquid.) I calculated the torque from the angle of rotation and found it to be both consistent and linear.

My own measurements indicated that the output power was equal to the input power, as predicted by the law of conservation of energy. From the measurements on the model, I was able to calculate what the input power and the output power would have been in an actual machine. They agreed within 20 percent over the entire range of speeds. Furthermore, most of the experimental error came from a known source in the particular apparatus I used. This is a far cry from the reports on the N Machine that indicated an output power four times as great as the input power. It certainly

casts doubt on the incremental power measurements of the N Machine, but does not explain the remarkable total power output results. To investigate these, I discussed my results with Kincheloe himself.

I spoke with Kincheloe on the telephone to see if he could shed any further light on his remarkable results. He acknowledged that his experiments were done on a ranch in Nevada in a remote location, with limited time, and using apparatus provided by De Palma. Furthermore, he had not personally calibrated a shunt, one of the key components in the experimental setup. He admitted the possibility that the (unpublished) measurements were in error, and had asked the inventor about the possibility of conducting further tests at Kincheloe's home. He had received no reply to this request, and meanwhile De Palma had moved on to the construction of a yet larger and more sophisticated N Machine. I am told that the new machine, built at considerable expense, is superbly crafted and contains some 200 pounds of rare earth magnets.

What can be learned from this? I think the most important lesson is that there are many scientists with sufficient interest to investigate new energy ideas. Scientific laws are not legislated, so attempts to pass special bills in Congress, as Newman is attempting, are futile. What is needed to interest a scientist is a series of reproducible measurements. Measurements on a machine running at a high crest factor are of no interest if the crest factor is not even measured, particularly in view of the easy availability of instruments for the purpose. Also, a single data point is of limited interest. A credible scientific experiment should produce a series of measurements over a range of conditions (such as angular velocity, excitation, voltage, etc.). If such measurements are carefully performed and indicate a new source of energy, I guarantee that the scientific community will be interested. As in the case of the N Machine, somebody will be inspired to repeat the experiment and refine the measurements.

It is true that if the results eventually prove to be negative, they will probably not be published in the mainstream scientific literature. This simply reflects the adage that extraordinary claims require extraordinary proof. If the proof is not forthcoming, then there is little point in publishing the claim. But the interest is definitely there, and I am confident that if a new energy source were to be discovered today it would be recognized and exploited with remarkable speed.

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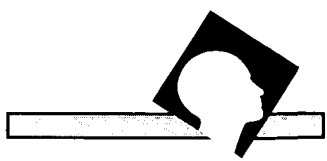
Biological Cycles and Rhythms Vs. Biorhythms

ANTHONY WHEELER

Biological cycles are an exciting frontier in current research. We now understand biological cycles and rhythms quite well. However, there is still much to discover.

The word *biorhythms* sounds much like "biological rhythms." Some may think it is just a shorter version with the same meaning. Indeed, an entry in the card index in my local library gives the direction: "Biorhythms. . . . See Biological Rhythms." Biorhythms are the fixed 23-, 28-, 33-day cycles said by some to pervade all life—the supposed cyclic variations in the physical (male), emotional (female, sensitivity), and intellectual attributes that determine the daily fluctuations in our moods, interests, abilities, and accident susceptibility.



Biological cycles and rhythms are well established. Where do 'biorhythms' fit in?

So where do biorhythms fit into our knowledge of biological cycles and rhythms? Are they synonymous? Are biorhythms a real part of biological science or just a pseudoscience of no value? I will give the general characteristics of biological cycles and rhythms and describe some typical ones to suggest how physiologists approach, study, and understand them. A comparison of physiologically based biological cycles and rhythms with biorhythms shows that biorhythms are, to say the least, in a class apart.

Cycles and Rhythms

The difference between "cycles" and "rhythms" is more than just etymological; the distinction is real and useful. A "cycle" is an endless series, a repeating sequence of events, where each event is the consequence of the preceding events

and the cause of the succeeding events (like the rotating wheel, or cycle).

One biological cycle is the electrical activity of the sino-atrial node of our hearts. Sodium ions (Na+) diffuse into the cardiac cell, and potassium ions (K+) diffuse out through pores in the leaky cell membrane.[1] This migration reduces the normal degree of electrical polarization across the cell membrane from -70 millivolts (mV). When this polarization has "decayed" to -60 mV, depolarization is triggered. This is the rapid free diffusion of sodium ions into the cell (potassium, chloride, and calcium ions are involved too), with the result that the electrical potential falls rapidly to zero and overshoots beyond to -60 mV.

This loss of the electrical polarization of the cell membrane triggers the free diffusion of ions through the adjacent areas of the heart cell membrane, the consequent loss of electrical polarization in that area, and the same sequence of events in progressively further adjacent areas. And so the wave of ionic diffusion and electrical depolarization, a self-sustaining action potential, propagates through the cell membrane throughout the heart, triggering muscle contraction as it passes.

Meanwhile, back at the sino-atrial node, the cell membrane resumes restricting the diffusion of the Na+ and K+, and complex proteins embedded in the membrane sequentially attract Na+ and K+, move the ions across the membrane, and release them, thereby pumping the Na+ back outside the cell and the K+ in. This is the energy-consuming sodium-potassium pump, and the ionic imbalance it produces regenerates the electrical polarization of -70 mV inside the cell.

No sooner have the Na+ and K+ concentrations been restored than diffusion through the membrane pores resumes, and the electrical polarization again decays. This is the cycle of activity within the sino-atrial node. Each event in the sequence is the consequence of the preceding events and, in turn, causes the succeeding events.

We can readily monitor the sino-atrial node cycle in an experimental animal by recording the aggregate electrical de- and re-polarizations of the cell membranes. With somewhat more effort we can measure the changing electrical potential across the membrane of individual sino-atrial node cells, or the influx and eflux of sodium and potassium ions.

"Rhythms," on the other hand, are series of events. Each event is caused by a preceding event, but each series does *not* cause the succeeding series. Often obvious rhythms are being triggered by inconspicuous cycles.

The muscle in the atria and ventricles of the heart display rhythmic activity. Each receives a wave of membrane depolarization (an action potential) originating in the cyclic activity of the sino-atrial node. This causes the cell membranes to depolarize, calcium ions to flow, and muscles to contract. And this increases the pressure within each chamber and pumps the blood.

Each series of events within the atria and ventricles is triggered by the membrane depolarization that originates in the sino-atrial node; each series is relatively unaffected by preceding series and has little (if any) effect on succeeding series or the cyclic activity of the sino-atrial node. The sino-atrial node can be separated from the rest of the heart (an analogous experiment can easily be performed on the intact toad heart); the sino-atrial node continues its cyclic activity oblivious of the quiescent atria and ventricles (one ventricle in the toad). Another easy experiment in the toad

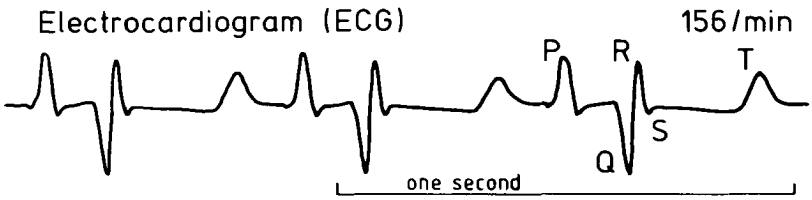


FIGURE 1: The Electrocardiogram. Electrodes placed on each of the four limbs and the chest allow the rhythmic net electrical activity of the heart to be recorded as the electrocardiogram (ECG). Since all the atrial cells depolarize synchronously and the ventricular cells depolarize and repolarize synchronously, the electrical changes generated are in phase and contribute to the identifiable net signals. (This is actually recorded in an anesthetized cat, hence the 156/minute, while the resting human heart rate is typically about 70/minute).

is to cool the sino-atrial node and slow its cyclic activity; consequently there is a greater interval between successive contractions of the ventricle. However, cooling the ventricle has no effect on the sino-atrial node's activity or the rhythm it generates; the ventricle continues to contract at the same rate. The cyclic activity of the sino-atrial node sets the rhythm for the whole heart; hence its popular name "the pacemaker."

Reasons and Causes (Why and How)

Biological cycles and rhythms are not random; they occur for a reason and have definite causes. The ventricles of the heart contract rhythmically to pump our blood; the cause of the contractions is the successive waves of membrane depolarization. Identifying the reason (the need for blood to be circulated) is important since this explains the timing of the immediate cause. The reason is the result of evolution; the cause, the result of biochemistry.

Sheep are sexually active in the autumn. The reason is that pregnancy lasts five months, and lambs must be born late enough for there to be sufficient grass to sustain the ewe through the nutritional demands of late pregnancy and lactation, yet early enough for the lamb to have sufficient time for growth before the rigors of the next winter. Lambs will survive only if they are born as a result of a mating period of a few weeks in autumn; consequently, the sheep has evolved a restricted and carefully timed breeding season.

How does the sheep know what the conditions of the pastures will be in five months time? Fortunately plant growth is determined by the weather, and the seasonal changes in the weather are repetitive. The most reliable indicator of the time of the year, and therefore of the weather five or more months later, is the changing day-length.

The changing reproductive status of the sheep as the breeding season approaches can be observed. The increasing diameters of the ram's testes can be measured. Surgery on the ewe's ovaries reveals the growth of follicles and ovulation. Introducing the ram to the flock will identify the ewes in heat (estrus) as they stand to his mounting. (Nonestrous ewes are not attractive; and if the ram did try mounting, they would run away vigorously!)

The cause (the "how") of the sheep-breeding season is of great interest to scientists. Light stimulates nonvisual photoreceptors in the retina. The sensory nerves bypass the visual centers in the brain to trigger the

suprachiasmatic nuclei of the hypothalamus. Here action potentials are generated in sympathetic nerves that are routed down the spinal cord in the neck and back up to innervate and inhibit the pineal gland. A remnant of "the third eye" (it still exists in fish and amphibia)—René Descartes's "seat of our rational souls"— the pineal secretes a number of chemicals. Best understood so far is the association of darkness with the pineal's enzymes and its synthesis and secretion of the hormone melatonin. As well as blanching the skin of tadpoles, melatonin can stimulate or inhibit reproductive activity, depending on the species. During the lengthening nights of autumn the melatonin secreted in sheep during the hours of darkness decreases the negative feedback sensitivity of the hypothalamic-pituitary axis to gonadal steroids; consequently greater secretion of gonadotrophic hormones stimulates the ovaries and testes (in different animals) and the breeding season starts.

The pineal-melatonin system is one line of research that has had great success in recent years and is still being investigated. Both the reason (the coordination of the needs of the mother and the lamb for food with plant growth) and the cause (light, pineal melatonin, sensitivity to steroids) are well understood.

Biological Clocks

Many biological rhythms are triggered by environmental changes. The tim-

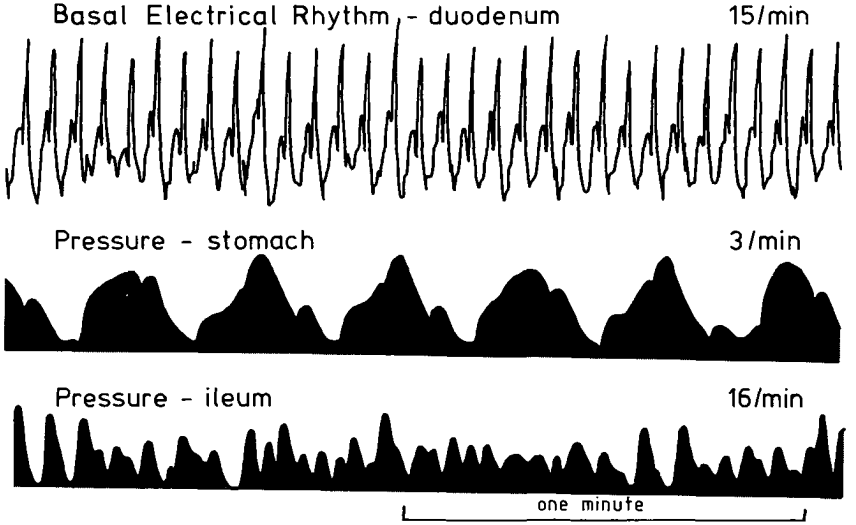


FIGURE 2: Electrical and Muscular Rhythms in the Gut. Fine wire electrodes sewn through the longitudinal muscle in the wall of the stomach or small intestine allow electrical activity to be recorded. This reveals the Basal Electrical Rhythm (BER)—a wave of partial depolarization of the muscle cell membranes that propagates through the gut (the top trace). In the stomach this rhythm originates in a "pacemaker" located at the entry of the esophagus, and in the small intestine one "pacemaker" is found near the entry of the bile duct into the duodenum with another two or three pacemakers further down in the jejunum and ileum. The BER oscillates at 3 cycles/minute in the stomach and 9 to 12 cycles/minute in the small intestine and propagates through the longitudinal muscle at 5 to 40 and 200 mm/second, respectively. (These are the figures for the human. This recording was made in an anesthetized cat, which may explain the greater frequency (15/minute) of the duodenal BER.)

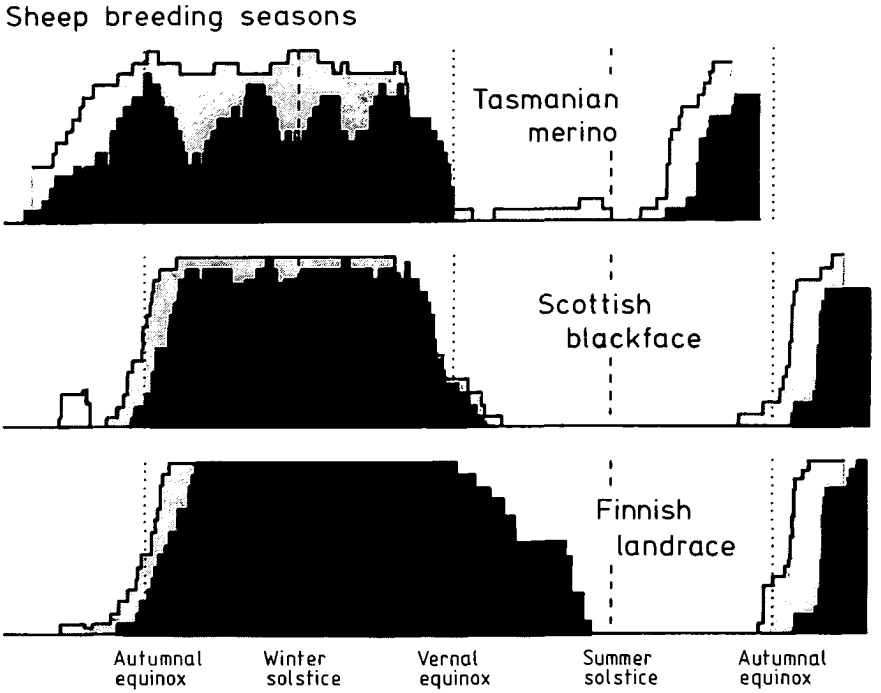


FIGURE 3: The Sheep Breeding Season. The timing of the onset of the sheep's breeding season is determined by the day-length. The breeding season consists of a series of ovarian cycles, each including waves of follicle growth, ovulation, luteal activity, luteal regression, and back to another wave of follicle growth. The ovarian cycle is controlled by ovarian steroid and gonadotrophic hormones. The ovarian follicular estrogen secreted in great quantities for the 12 hours before ovulation induces estrous activity. During estrus the ewe is attractive to the ram and will stand still to his mounting and intromission. Estrus synchronizes mating with ovulation, sex with fertility.

In natural conditions the ewe would conceive during her first or second estrus. However, by using vasectomized rams we can observe successive estrous activities throughout the year without our ewes' getting pregnant and ceasing cycling. This exposes the duration and end of the breeding season, normally masked by pregnancy and lactation.

The figure shows behavioral (estrus; light hatch) and ovarian activity (ovulation; dark hatch) during the year in three breeds of sheep in the same environment. The three breeds react differently to the same changing day-length, the Scottish blackface showing the "classic" short breeding season.

ing of the sheep's breeding season is determined by the decreasing day-length of autumn. But supplement the short days of winter with electric lights and abbreviate the long days of summer with light-proof blinds so as to maintain a constant "day"-length, and the sheep-breeding season will still start at about the right time. While the timing of our cycles and rhythms may be refined (entrainment) by clues from our environment (the *zeitgeber*), taking those clues away reveals inherent "clocks." These biological clocks generally run a little slow, so that they initiate activity only if the normal environmental trigger is absent (sustained heavy cloud?).

In normal circumstances the activity of our body follows a rhythm appropriate to our changing needs. Our body temperature is lowest in the

morning and highest in the evening, urine production by the kidneys decreases at night, tiredness and fatigue come over us late in the evening, and so on. Remove all external clues to the passage of time by housing volunteers in insulated, isolated caves, and the same pattern of activity is still apparent, except with a slightly longer "day" of about 25 to 27 hours. (Many aspects of this variation, like body temperature in humans and activity in hamsters, are easily measurable.) This is the circadian rhythm.

Synchrony

Animals that live in shallow water need to anticipate high and low tides; their behavior describes a 12.4-hour circa-tidal rhythm. Animals living higher up the beach are interested in the timing of the highest (spring) and lowest (neap) high tides; their cycles are 14.8-days long (circa-semi-lunar). All the animals in these populations follow the same pattern of behavior at the same time; their cycles are synchronized.

In artificially constant conditions these animals cannot keep their cycles in step with their environmental trigger; the cycles "free-run" at 13 to 14 hours and 15 to 17 days, respectively. It is only in these conditions that the animals get out of step with each other and the population loses synchrony. The approximation of our inherent clocks is insufficient, our endogenous rhythms are only approximate, hence the "circa" ("about") in circadian rhythms. The remarkable synchrony in natural populations may be either coincidental (as in the feeding activity of the fiddler crab) or the purpose of the cycle (as in the swarming of the grunion fish on California beaches on the crest of spring high tides).

Manipulation

Take a jet plane on a trip east or west and you can rapidly cross several time zones. On arrival you adapt your behavior to the local pattern of activity: sleeping at the new nighttime, getting up in the new morning, working during the new day, seeking entertainment during the new evening, and so on. However, your body's physiology is still on home time; you feel sleepy in the day, energetic in the evening, and wide awake at night. This is "jet lag." This is to be expected; what is surprising is that within only five days your physiological rhythm adapts to your new behavioral rhythm.

Round up a flock of sheep in Britain and ship them to South America, and if you time it right they can have two breeding seasons within one calendar year. (This observation was one of the earliest clues to physiologists that the time of the sheep's breeding season is determined by the day-length.) Injecting or feeding melatonin to ewes in the autumn will retard the start of the breeding season.

Ride a bicycle vigorously and the parasympathetic nervous slowing of the sino-atrial node cycle will decrease, allowing your heart rate to increase from a typical 70 cycles per minute to about 100 per minute. With further exercise, sympathetic stimulation of the sino-atrial node will increase its cyclic activity and the heart rate will increase to more than 200 cycles per minute.

All the biological cycles and rhythms can be altered, or manipulated.

Biorhythms

Biorhythms are another matter entirely. Biorhythms are supposedly three cycles of absolutely fixed periods

(23, 28, and 33 days); each of the three biorhythms is said to "start" ascending from "0" at birth and continue unvaryingly until death. This is the same for everyone irrespective of style of "birth" (vaginal, planned [early] caesarian, or unexpected [late] caesarian) or the physiological status of the baby at birth (premature, early, term, or late). The history of biorhythms is described by Gardner (1966); why they supposedly start at "birth" is not explained.

Journey on a jet plane, work night shifts, volunteer for experiments into prolonged sleeplessness, or take drugs; nothing will change your biorhythms. Live in a constant, uniform environment with no clocks, under your endogenous 26-hour circadian rhythm, and your biorhythms will nevertheless continue at their 23, 28, and 33 24-hour "days." Biorhythms are presumably not easily fooled; no environmental trigger, *zeitgeber*, or entrainment for them.

It is said you can measure the changing accident rate associated with biorhythms; or relate sudden deaths and sporting performance to biorhythms. These are the claims. On investigation the evidence has proved to be surprisingly ephemeral. Repeated studies have shown the claims fail (Bainbridge 1978; Hines 1979). We cannot measure these mysterious biorhythms. There is no biochemical, neurological, or physiological variable or correlate that can be monitored. As one popular book says: "Among our bodily rhythms are three clearly defined cycles that affect our behavior patterns but which have no cause and effect as such: They are simply continuous physiological changes" (West 1980:7). Biorhythms provide the physiologist with none of the usual electrical, mechanical,

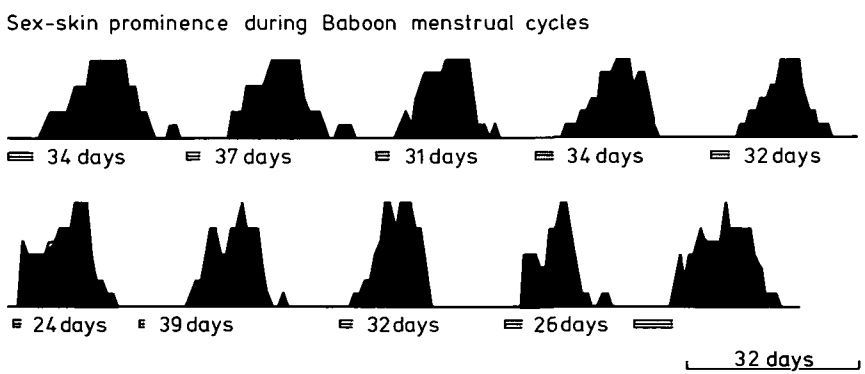


FIGURE 4: The Primate Menstrual Cycle. Cycles of ovarian activity in female nonpregnant primates produce sequentially estrogen and progesterone hormones that generate the changes associated with the menstrual cycle. Most obvious to humans is the blood lost at menstruation, though there are other aspects, such as edema (puffy swelling of the feet), tenderness of the breasts, and temperature changes. In the African baboon the estrogen secreted for two weeks by the growing follicles stimulates engorgement of the sex skin on the female's backside; the degree of engorgement and coloring (hatched areas) can be reliably subjectively assessed each morning. With ovulation the estrogen concentration decreases abruptly and the corpus luteum secretes progesterone for two weeks; these changes in turn cause an abrupt collapse and loss of color to the sex skin (detumescence). At the end of this period the corpus luteum regresses and the progesterone concentration falls; this stimulates menstruation (bars). The time between the start of one menstruation and the next is the length of the menstrual cycle; this averages about 32 days in the baboon.

hydraulic, or biochemical variables to record and analyze.

Biological cycles and rhythms are components of our complex and harmonious biology. Biorhythms, on the other hand, are unrelated to any other biological variable; they are apart and unconnected. Biorhythms are easy to explain and understand—but only because there are no physiological changes to explain, no physiological consequences to understand. Biological cycles and rhythms explain observations; periodic heart sounds, body temperature changes, menstruation, and so on, all make sense as components of a more basic rhythm. Biorhythms explain no such observations; there is no unexplained data in need of such a notion.

Note

1. Original references have not been provided for much of this information; otherwise the references would occupy more space than the text. Most of this material is likely to be found in any textbook on physiology (for example, Arthur C. Guyton, *Textbook of Medical Physiology*. Philadelphia: W. B. Saunders, 1986).

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GREAT FRAUDS IN THE HISTORY OF MAGIC

Book Reviews

The Burgess Shale and Scientific Revisionism

Wonderful Life. By Stephen Jay Gould. W. W. Norton & Company, New York, 1989. 346 pp. Cloth, $19.95.

PAUL T. RIDDELL

In 1909, Secretary of the Smithsonian Charles Doolittle Walcott discovered a small geological formation in the Canadian Rockies now known as the Burgess Shale. Dating from the beginning of the Cambrian Period of the Paleozoic Era, some 530 million years ago, the Burgess Shale contained fossils from the "Cambrian explosion," when multicellular life filled the ancient seas covering our planet. Upon Walcott's detailed examination of the fossils entrapped therein, he claimed that all the fossils represented orders already known to modern taxonomy, a statement not challenged by paleontologists until 1971, when Harry Whittington at Cambridge published a paper on *Marella*, a small arthropod classified by Walcott as a trilobite. Whittington noted that not only was *Marella* not a trilobite, but it had no comparison to any other known arthropod and no known descendants. From *Marella*, Whittington, with the help of Simon Conway Morris and Derek Briggs, discovered several species that have no analogue to any other known life forms but were nevertheless classified by Walcott as representative of known animal groups.

In his newest book, *Wonderful Life*, Stephen Jay Gould illuminates the Burgess Shale re-evaluation in his usual style: willing to spend the time to explain matters of classification and anatomy to laypersons while not insulting those who already are familiar with the matters at hand. In 346 pages, Gould manages to dispel many of the myths of "scientific investigation" while conducting a tour through the Burgess fauna and relating the personal stories of the paleontologists who prized answers from the specimens. In particular, he points out the importance of questioning "scientific fact" and rechecking information for new truths, since the unconscious biases and incomplete knowledge of the investigator may conceal as much as they reveal.

Heterodox hypotheses in paleontology are not exactly lacking at this time: Robert T. Bakker (*The Dinosaur Heresies*, 1986) caught public fancy and professional ire with his self-termed heresies about dinosaur physiology and function, and Gould and Niles Eldridge's theory of punctuated equilibrium helped infuriate proponents of evolutionary gradualism and creationists as much as it stirred the

imaginations of students and informed laypersons. However, the Burgess reinterpretations act on a much deeper level than those: with the wide variety of fauna present at Burgess times, the chance is astronomically insignificant that anything resembling us would reappear if the entire flow of time were reversed and allowed to run on an uninhibited course. In fact, the entire cycle of life, from the development of the eukaryotic cell to the development of *Homo sapiens* as an intelligent species, counts as little more than lottery wins and crap shoots rather than an upward spiral toward mankind. Had not certain accidents or opportunities occurred, any number of possibilities, from the algoid stromatolites' remaining the dominant life form in our seas to the dinosaurs' developing intelligent forms, may have occurred, and the "inevitability" of humanity would be relegated to the science fiction of whatever intelligent form evolved on Earth, if any.

Another point Gould relates, as a potential warning to both proponents and skeptics of particular theories, is that no matter the degree of expertise a researcher attains, he or she may be wrong. Walcott's treatises on Burgess life remained unchallenged for decades, partly because of limitations in examining the fossils (most of the Burgess specimens were housed in a building with no air conditioning, and the horrors of working in such an environment in July were aggravated by Walcott's reputation, both before and after his death) and partly because Walcott was, in his time, the preeminent expert on Cambrian fossils. Therefore, nobody bothered to ask the impolite but important questions: Was five-eyed and trunked *Opabinia* really a true arthropod, and was the aptly named *Hallucinogenia* the polychaete worm Walcott said it was? (A similar case concerns the notorious "dinosaur" *Aachenosaurus*, described in 1887 as a duckbilled dinosaur on the basis of two chunks of "bone." In 1888, the "bone" turned out to be pieces of petrified wood.)

Finally, Gould allows the reader to view one of the most fantastic periods of earthly life—right after the "Cambrian explosion," when the variety and oddness of life exceeded anything we know of today: *Nectocaris*, a species of unknown affiliation with features of both arthropod and chordate; *Dinomischus*, a stalked animal with parallels to the crinoids in shape and possible habits; *Anomalocaris*, the largest known predator of Burgess seas, with a nutcracker mouth resembling a pineapple slice; and *Pikaia*, the first known chordate, of which our own species claims relation. All descriptions of the animals come accompanied with illustrations, as most have such wildly diverse body plans that description without pictures is wholly inadequate to the purpose of illuminating these creatures. Best of all, each description comes complete with a view of the attendant investigation that unearthed (in some cases literally) the unique features of these extinct animals.

As usual, Gould shines in presenting scientific points that, to the layperson, appear minor but help demonstrate greater wonders. At a time when an asteroid-collision explanation of the extinction of the dinosaurs rests on everyone's lips, the even more fascinating view of the Burgess Shale and its implications for evolutionary theory remains relatively obscure—a situation that this book will correct.

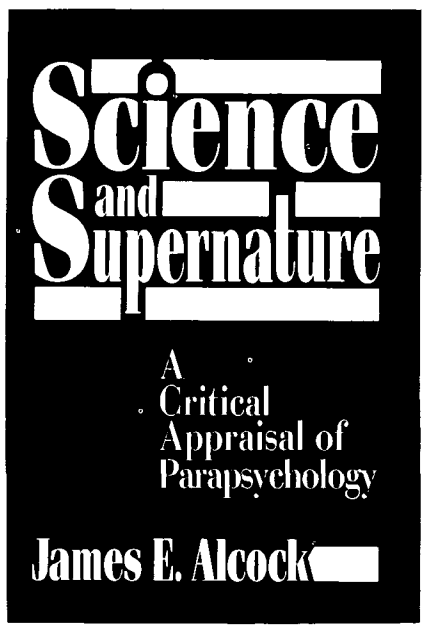
Paul Riddell is a writer in Dallas, Texas.

The Challenge and Defeat of Supernature

Science and Supernature: A Critical Appraisal of Parapsychology. By James E. Alcock. Prometheus Books, Buffalo, N.Y., 1990. 186 pp. Cloth, $24.95.

ROBERT A. BAKER

For anyone seriously interested in parapsychology and its claims, *Science and Supernature* is required reading. When I first learned of its impending publication I was somewhat baffled. How, I wondered, could James Alcock add anything new or improve upon what he accomplished earlier in his splendid and definitive *Parapsychology: Science or Magic?* (Pergamon, 1981) and his brilliant analysis of the parapsychologist's motives in his essay "Parapsychology as a 'Spiritual Science' " in Paul Kurtz's *A Skeptic's Handbook of Parapsychology* (Prometheus Books, 1985). As soon as I opened *Science and Supernature*, however, the mystery was solved.



Alcock's new work is primarily a critique of much of the best research parapsychology has produced, and the second half of the book examines in detail the psi research involving remote viewing and the use of random-event generators. Contained here also is the only in-depth, experiment-by-experiment analysis of Helmut Schmidt's research that has been published. The first half of the book is an expanded version of Alcock's relatively inaccessible paper "Science of the Anomalous or Search for the Soul?" which appeared in the journal *Behavioral and Brain Sciences* in 1987.

The book also provides a specific response to those critics who accused Alcock of "evaluating the parapsychologist's belief systems rather than their research efforts." In toto, the book is a valuable follow-up to his work for the National Research Council's Committee on Techniques for the Enhancement of Human Performance and provides the "second opinion" requested by the Army Research Institute on a set of experiments already evaluated by the parapsychologist John Palmer. While Palmer concluded that some evidence for "anomalous processes" exists, Alcock's conclusion after careful and extensive study was that the evidence from the "best cases" provided by Helmut Schmidt, Robert Jahn, and Russell Targ and Harold

Puthoff was not persuasive.

Despite the 1988 conclusion of the NRC committee that there is "no scientific justification from research conducted over a period of 130 years for the existence of parapsychological phenomena" and its strong recommendation that the best work in the psi field continue to be monitored, rather than being encouraged by the latter remark the parapsychological community charged that the conclusions were unwarranted and that the authors of this report were biased—particularly Alcock and Ray Hyman. Later in the year at the instigation of Senator Claiborne Pell, a psi advocate, the Congressional Office of Technology Assessment (OTA) organized a workshop on experimental parapsychology and assembled a number of investigators—primarily parapsychologists—to take issue with the NRC report and Alcock's background paper specifically. Alcock rightly asks, "Given the weakness of the evidence accumulated over a century, the most interesting question must surely be, why does the pursuit endure?"

Focusing specifically on the Schmidt and Jahn random-event-generator studies and the Targ and Puthoff remote-viewing work, Alcock was led to the "inescapable conclusion that none of this research has served to demonstrate the reality of psi phenomena." Alcock also adds that serious design flaws and shortcomings must be eliminated before anyone can have confidence in their results.

The most serious problems are found in the failure of the psi researchers to provide proper control groups or control trials. Failure to use the Hansel procedure in the Schmidt studies—to generate control group data and thus allow a direct comparison of the "experimental" data with the baseline, coincidental "background" rate of scoring, as empirically determined in the control trials—is seen by Alcock and others as a fatal omission. A modification of this procedure would also be advisable in the Jahn studies. Similarly, more traditional control trials are also needed in the remote-viewing research.

Alcock justifiably asks, "Since psychological research is built on the cornerstone that compares experimental and control conditions why must we abandon this approach when we investigate parapsychology?" The arguments that psi forces cannot be turned off and that they equally affect both experimental and control trials Alcock regards as unacceptable. So do 99 out of every 100 other psychologists. In Alcock's words, "In the absence of conclusive, or even persuasive, evidence that psi exists, there is no reason to suspend the very procedure that could serve as our strongest bulwark against erroneous interpretation of data. If the phenomenon disappears in such a case, then we should bother no more about it."

While Part 2 of the book adequately meets the challenge of the OTA workshop committee, Part 1 is a brilliant and succinct overview of the current status of supernature, i.e., psi. It provides as fair and evenhanded a summary of psi's claims and counter claims as can be found. Alcock's approach is to pose and answer seven definitive questions: (1) What is psi; how is it defined? (2) Is psi possible? (3) If psi exists, how can it be detected? (4) What is the evidence that psi exists? (5) Does parapsychology follow the rules of science? (6) Are the critics fair? and (7) Is rapprochement between psychology and parapsychology possible? Although Alcock's arguments and answers make up the body of Part 1 and should be carefully read to be fully appreciated, we can summarize a few of his more insightful

responses to these questions.

1. Psi phenomena, Alcock notes, are defined in a negative manner; and, if the current scientific world-view is correct, psi phenomena are impossible.

2. Because psi is a concept that would revolutionize science, most skeptics use the criterion of "beyond all reasonable doubt."

3. Before personal experiences demonstrated by "gifted" psychics or results from laboratory experiments can be accepted, we have to look at "internal validity"—the degree to which the experiments are free from the influence of extraneous variables that could provide alternative explanations for the results, a consistent pattern of results across experiments, and the repeatability of individual experiments by others.

4. Although many claims for the existence of psi have been made, studies of out-of-body experiences, the ganzfeld effect (reduced sensory stimulation condition), remote-viewing studies, and random-event-generator studies are plagued by methodological and statistical flaws that render such evidence questionable.

5. Several aspects of psi evidence run counter to the spirit of scientific inquiry, including making the psi hypothesis unfalsifiable by explaining away null results and nonreplications, engaging in wild "anything goes" speculation, and failing to establish any overlap with other scientific disciplines.

6. Although some psi advocates accuse critics of ignoring the psi literature, of being afraid of psi's implications, or of religious bias, none of these accusations are valid. Over the years, on numerous occasions, parapsychology has had its day in court, but "after a century of research there is still nothing substantive to show."

7. Although some writers call for a collective focus by skeptics and parapsychologists on finding explanations for anomalous experiences, this, for most parapsychologists, is not what psi is all about. Instead, as Alcock notes, parapsychology is, at base, the classical "search for the soul"—not the soul as described in various religions, but the notion that the mind can function separately from the physical brain and the human personality is something beyond the stuff of atoms and molecules. Dualism, Alcock insists, is in any debate about parapsychology the only issue on the hidden agenda.

Again, on all fronts Alcock has met, challenged, and defeated his adversaries. In a fascinating postscript, "A To-Do About Dualism," he deftly dispatches several of the most worrisome carpers and critics. Despite the denials from several psi sources, the evidence is more than sufficient to support Alcock's insightful summary statement:

> Psi has been postulated not because normal psychology is incapable of accounting for people's apparently psychic experience, nor because of inexplicable findings in physics or chemistry; nor is it the logical outgrowth of some compelling scientific theory. Rather, the search for psi is now, as it has been since the formal beginning of empirical parapsychology over a century ago, the quest to establish the reality of a nonmaterial aspect of human existence—some form of secularized soul.

Perhaps in the century ahead we will see an end to parapsychology's material claims and its ambition to become a science as well as a more open admission of the basically religious nature of its quest. Until that happy day arrives, poor psi is stuck

with the same age-old challenge: all that is needed to change the attitude of the scientific establishment is some good, clear, substantive evidence of a truly *psychic* phenomenon. So far we haven't seen it. Without it, Alcock insists, parapsychology can never become a science.

The book's two appendices contain a detailed critique of the Schmidt studies and serve as models for the sort of detailed and incisive evaluation good experimental psychologists produce routinely and with ease. All psychologists as well as skeptics are in Alcock's debt, and those looking for arguments to wield in the psychic debate owe him the most. Finally, in the struggle between Science and Supernature, the smart money's on Science, just in case you didn't know.

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Mysteries, Myths, and Misconceptions

Frauds, Myths, and Mysteries: Science and Pseudoscience in Archaeology. By Kenneth L. Feder. Mayfield Publishing Co., 1240 Villa St., Mountain View, CA 94041. 1990. 231 pp. Paper, $12.95.

GORDON STEIN

Kenneth L. Feder, an archaeologist, has given us a much-needed review of many of the popular conceptions and misconceptions in archaeology. He has done a great service to the future thinkers of the world by preceding his main topics with an introduction to science and a distinction between science and pseudoscience. What's more, he actually discusses how an investigator comes to the conclusion that he or she "knows" something is so or is not so. It is a brief introduction to the philosophy of science that is so often omitted in introductory science books. Now students can at least understand *why* scientists can be fairly confident that some parts of popular archaeology are really only pseudoscience and not accepted by archaeologists.

Among the topics covered are pre-Columbus visits to the New World by non-Indians, Atlantis, the Cardiff Giant, the Piltdown Man, and the possible visits to the earth by "ancient astronauts." While some of these (e.g., Piltdown Man) have been covered by many previous authors, few have tried to use the tools of modern scientific archaeology to show *why* probability is greatly against the authenticity of the particular claim. Feder is especially good on the Mound Builders and other North American archaeological sites, including those attributed to Norsemen, Irish monks, and lost Hebrew tribes. This is an area not often examined critically in the popular literature. There is also a useful chapter on "psychic" archaeology (verdict "decidedly negative") and dowsing.

Although they are briefly mentioned, one would have liked to hear more about Easter Island's statues, the pyramids, the Kensington Rune Stone, and other artifacts that are

demonstrable frauds. It is not that Feder doesn't want to discuss them, but more the fact that a second volume would be required to cover all the items that really need a full critical examination. Let's be happy with what is presented in this book, however. It's clearly written, well documented, and concludes with a fine piece of advice to would-be scientists and the public at large: So many interesting things really do exist to command our attention and investigation that it is foolish to cling to beliefs in things that are demonstrably not authentic. Why *invent* mysteries when there are so many real ones to examine?

Frauds, Myths, and Mysteries would also make fine supplementary reading in a college archaeology course.

Dr. Stein is a physiologist and a CSICOP consultant.

The Joke's on Us

Media Hoaxes. By Fred Fedler. Iowa State University Press, Ames, Ia., 1989. 266 pp. Cloth, $24.95.

ROGER KLARE

When the Martians came to town in 1938, one million Americans listening on the radio thought it was no joke. On that fateful night before Halloween, *The War of the Worlds* ceased to be fiction. Orson Welles was baffled: despite several program disclaimers, people panicked. What was never intended as a deception became known as the most famous radio hoax in history.

The most famous hoax in American journalism, according to media historian Fred Fedler, occurred one hundred years earlier. In 1835, a series of unusual stories appeared in the *New York Sun.* As in the radio broadcast, extraterrestrials were the main characters. This time it was batmen on the moon causing the excitement on Earth. Unlike the Martians, these creatures were peaceful folks who had no need to leave their own world.

A Cambridge-educated reporter named Richard Adams Locke created the hoax. He had an interest in astronomy and was aware of speculation about life on the moon. Locke began writing about some unbelievable sights on Earth's closest neighbor, crediting Sir John Herschel, the famous English astronomer, with the discoveries. According to Locke, Herschel used a powerful telescope to observe several life forms, including flowers, buffalolike animals, and batmen (and, of course, batwomen).

The moon story was very convincing. Before the last of six installments was published, the *Sun* had more readers than any other newspaper in the world. The story then spread to Europe and gained many believers, some claiming it was true long after the *Sun* admitted it was a fabrication. Herschel eventually heard about the hoax (he was making astronomical observations in South Africa) and took it in good humor. But he was concerned that the public found such pseudo-discoveries more captivating than his real science.

Fedler points out why the hoax succeeded: the public was receptive to the idea of life on the moon, the story used scientific language and a famous astronomer as the source, and readers did not expect to be fooled. This story marked the beginning of an era of media hoaxes that lasted until 1924.

What are the special features of a media hoax? *Webster's New World Dictionary* defines a hoax as "a trick or fraud, especially one meant as a practical joke." A practical joke, in turn, is "a trick played on someone meant in fun." The first feature of media hoaxes, Fedler explains, is that most try to entertain and amuse the public. In his words, "Thus, the hoaxes are a form of practical joking, but on a grand scale."

The second feature of media hoaxes is that reporters often tell readers the stories are fabricated. They may state this outright, or they may drop hints. One such hint is the appearance of Lirpa Loof and Isa Lyar in phony stories printed on April 1.

The author describes the final feature of media hoaxes: "Hoaxes broadcast by radio and television stations are sometimes unintentional. The nation's broadcasters rarely try to fool anyone, but the public is more gullible than most people realize."

Media Hoaxes is a fascinating history of journalistic deceptions. The styles range from the colonial satires of Ben Franklin, to the western humor of Mark Twain, to the urbane entertainment of H. L. Mencken. One major issue the author addresses is why the nineteenth century was such a particularly good time for hoaxes.

In the 1800s newspapers reigned as the sole mass medium. It was a time of press barons and of the penny press. Fedler explains that until the 1830s newspapers catered to an elite clientele—and charged the hefty price of six cents a copy. Enterprising publishers realized they could reach a larger audience by emphasizing sensationalist stories and humorous human-interest articles, and by lowering the price to a penny. Hoaxes became an acceptable part of the strategy to increase circulation.

As the power of the press grew, the freedom of the press became a license. The author discusses one editor whose actions demonstrated just how powerful the press had become.

The editor was Wilbur Storey, owner of the *Chicago Times*. In 1875, Storey ran an article about a horrendous theater fire. He included eleven headlines above the story, the last of which identified it as a hoax. But few readers got that far—the rush to find the theater and its victims was on.

Some readers complained loudly about the hoax. Storey defended his actions by claiming that the spurious account would shock the public into seeing the real dangers in Chicago's unsafe theaters. Despite his defense, the story was still pure sensationalism. His newspaper prospered as a result.

During the 1800s, the idealistic libertarian theory of the press—the idea that truth emerges in the open marketplace of ideas—was turned on its head. Continuing emphasis on sensationalistic stories eroded this ideal and replaced it with yellow journalism. This unflattering phrase first appeared in 1898, when it described stories in the *New York Journal*, a paper published by William Randolph Hearst.

As Fedler points out, journalism began to change by 1924. In that year, the *New York Herald Tribune* ran a series of stories about a ship operating as a floating cabaret just beyond U.S. territorial waters. Since this was during Prohibition, the story attracted public interest and appeared to have some truth to it. Other newspapers,

the Coast Guard, and government officials also wanted to find the ship.

The joke had clearly gone too far. When the guilty reporter confessed, the *Tribune*'s editors responded in a novel way: they fired the reporter and printed a retraction. A new era of social responsibility had begun.

A few reporters have concocted hoaxes at times other than April Fool's Day, but today this is rare. A bigger problem comes from another source. Fedler explains: "Other hoaxes, perhaps a majority of those now appearing in the media, are created by nonjournalists, usually for fun or profit." The mass media are vulnerable to such manipulation, primarily because journalists cannot check the accuracy of every detail in every story, and sometimes may not even check available facts.

Media hoaxes have had disturbing effects on some people. The author writes: "Some Americans seem to believe everything the media report. Some even verify the details. After seeing a hoax, people swear that they witnessed the events or possess evidence proving that the details are true." Some hoaxes are remarkably long-lived. H. L. Mencken's bogus bathtub history, originally published in 1917, continues to thrive despite efforts to subdue it.

Today's tabloids are a legacy of the hoax era. Fedler notes that some tabloids bear a likeness to the earlier hoaxes. Moreover, tabloids provide a form of entertainment for some people.

Stories about alleged paranormal events, as reported in the mass media, are another legacy. The author discusses a few examples of paranormal stories that are obvious deceptions, such as the Tamara Rand case of 1981 (*SI*, 5[4]:6). He doesn't discuss possible connections between media hoaxes and paranormal reporting in general. Nevertheless, media hoaxes and paranormal stories do have some similarities.

Just as most media hoaxes aim to entertain and amuse, so do most paranormal stories. Journalists often treat the paranormal as a joke, and they expect their audience to do likewise. Some reporters use a tongue-in-cheek style, a hint for readers not to take the article too seriously.

The problem is that these "entertaining" stories are often reported as fact. Some people will therefore believe that what is written is what actually occurred. This is not to say that journalists concoct hoaxes when reporting alleged paranormal events. They often just leave out the truth or never pursue it.

Hence, there remains a need for skeptics and responsible journalists to nudge the media to a position of social responsibility. Otherwise, the joke's on us.

Roger Klare, a science writer and consultant, lives in Athens, Ohio.

Some Recent Books

Listing here does not preclude review in a future issue.

Curses! Broiled Again! Jan Harold Brunvand. Norton, New York, 1989. 335 pp., index, $18.95, cloth. Professor Brunvand's books have brought the study of urban folklore into public prominence. By debunking such urban legends as poisoned Halloween candy (in this book) and the cement-filled car (in *The Vanishing Hitchhiker*) he reveals the truth and at the same time demonstrates our gullibility. This collection features little on the paranormal, although earlier books discuss such items as satanic-cult rumors and, of course, the aforementioned ghostly hitchhiker. Brunvand's books are funny and easy to read, but his citations are scholarly. For the person who thinks he or she can't be fooled, this book is an illuminating lesson in the need for skepticism.—*Robert Lopresti*

Deadly Blessings: Faith Healing on Trial. Richard L. Brenneman. Prometheus Books, Buffalo, N.Y., 1990, 390 pp., index, $21.95 cloth. An examination of faith healing through three controversial court cases: the prosecution of Christian Scientist parents whose small child failed to get medical treatment and died of bacterial meningitis; a Filipino "psychic surgeon" (Brother Joe), who claimed to have removed a cancerous lump without breaking the skin; and a West Coast psychotherapist's practice involving an array of drugs, New Age mysticism, and mind control, including a bizarre "hot tub" treatment. Brenneman is able to examine these practices with the skill of an investigative journalist and the compassion of one who has been there: he's a former Christian Scientist, he's lived in a New Age commune, and he once believed in psychic surgery. A valuable examination of cases that have resulted in court trials over the issue of harm.

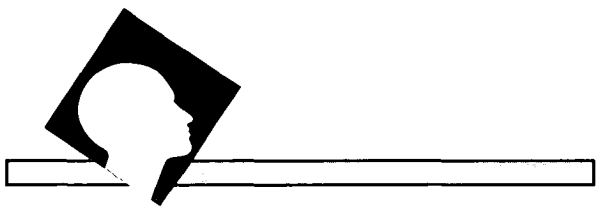
The Nature Fakers: Wildlife, Science & Sentiment. Ralph H. Lutts. Fulcrum Publishing, 350 Indiana St., #510, Golden, CO 80401, 1990, 256 pp., index, $22.95, cloth. A very intesting examination into the "nature fakers" controversy that began in 1903, when the naturalist John Burroughs accused a number of prominent nature writers of fabricating natural history "facts" and overdramatizing animal life in the field. The public debate lasted four years, and the final blow to the "nature fakers" came from Burroughs's ally, President Theodore Roosevelt, in 1907. Although the author, a museum director in Massachusetts, deals mainly with the history of this controversy, he also draws parallels in an Afterword with "fakers" today, especially the issue of prominent book publishers' issuing works that claim to be fact but appear to be fiction.

Physics and Psychics: The Search for a World Beyond the Senses. Victor J. Stenger. Prometheus Books, Buffalo, N.Y., 1990, 323 pp., index, $22.95, cloth. A physicist critically examines theories of a transcendent reality in

terms of all that is currently known about nature at its most fundamental level. An excursion that extends from true scientific bizarre phenomena, such as supernovas, neutrinos, and quantum physics, to claims of laboratory parapsychology, New Age cosmic mysticism, and thought waves and "energies of consciousness." Anyone who has read the several past popular books about "mystical physics"—as well as all who have had claims from these books presented to them as a new view of nature—should read this clear-thinking, authoritative appraisal and counterbalance.

—*Kendrick Frazier*

Articles Of Note



Bloch, Lawrence. "Stop Making Sense." *Writer's Digest.* January 1990, pp. 59-60. Essay on how fiction writers distort reality by always having characters' premonitions come true. "Fictional fortunetellers are always on the mark. Whatever the mode of divination . . . their predictions always come true." However, "In Life As We know It, most fortunetellers are wrong most of the time. . . . Predictors hardly ever get anything right." Bloch says that "because we've come to know that all predictions and premonitions come true in fiction," we take them for "foreshadowing and brace ourselves for their fulfillment." Says Bloch: "It never occurs to us to regard this as unrealistic."

Browne, Malcolm. W. "In Alchemist's Notes, Clues to Modern Chemistry." *New York Times,* April 10, 1990, B5, B9. Reports how modern historians and scientists reexamining old alchemist documents "have begun to discern kernels of genuine chemical insight suggesting that the science of chemistry may have evolved from alchemy much earlier than hitherto believed."

Campbell, Steuart. "Film of a UFO or Venus?" *British Journal of Photography,* May 3, 1990, pp. 24-26. Investigation indicates that the New Zealand UFO shown on television news accounts worldwide January 3, 1979, was very likely the planet Venus, seen under unusual atmospheric optical conditions.

Cohen-Mansfield, Jiska, Marcia S. Marx, and Peria Werner. "Full Moon: Does It Influence Agitated Nursing Home Residents?" *Journal of Clinical Psychology,* 45(4):611-613, July 1989. The hypothesis that elderly nursing home residents become increasingly agitated during full moon was not supported by a study that recorded their behavior and the occurrence of full moon. In all analyses, agitation was observed *less* often when the moon was full than during the other three lunar phases, although the differences were not statistically significant.

Hautala, Earl. "Dandruff and Reproducibility." *Etc. A Review of General Semantics,* 46(3):267-269, Fall 1989. A

brief article on reproducibility as a central concept in science. Hautala also considers a critic's tendency to refer to science as a "religion."

Holden, Constance. "Irrationality—Skeptics Strike Back." *Science*, 248:165, April 13, 1990. News & Comment article reports on CSICOP Washington conference, with emphasis on concerns about scientific literacy and critical thinking, especially the talks by John Paulos, Michael Zimmerman, and Andrew Fraknoi.

Mapes, Mary. "Rating Problem? Let Satan Help." *Washington Journalism Review*, July/August 1989, p. 10. Two Seattle television stations competed for ratings in the May 1989 sweeps by searching for evidence of satanic cults in rural Washington. A Geraldo Rivera special had previously made claims of mass sacrifices in Mason County. One station tried to link serial murderer Ted Bundy to the alleged cults.

Nickell, Joe, and John F. Fischer. "The Crashed-Saucer Forgeries." *International UFO Reporter*, March/April 1990, pp. 4-12. Report of a thorough, independent investigation by a former private detective and a forensic crime analyst into the claims of crashed flying saucers in New Mexico in 1947, particularly the so-called Majestic-12 documents attesting to them. They find many "anomalous and suspicious elements" in the supposed Truman memo of Sept. 24, 1947, and the several other key MJ-12 papers. Their two-year investigation strongly supports Philip J. Klass's "smoking gun" evidence that shows the Truman signature to be a photocopy of an authentic signature affixed to a bogus document and recopied (*SI*, Spring 1990). They furthermore say the evidence suggests the forgeries show "the tell-tale signs of a UFO partisan at work," more particularly "a crashed-saucer zealot." They propose that motivations may have included silencing the skeptics and rejuvenating belief among the crashed-saucer faithful.

Quinlan, Cheryl. "Ghost Tracks." *Customs Today*, 25 (2): 33, 1990. A brief report on an unexplained happening near Riverside, California. Customs agents spotted an aircraft on their radar at night and sent aircraft in pursuit. The chasers reported seeing the vehicle come down at a well-lit landing site. Patrolmen arriving on the scene, however, found no lights, vehicles, or footprints.

Santino, Jack. "Occupational Ghostlore: Social Context and the Expression of Belief." *Journal of American Folklore*, 101(400):207-218, April-June 1988. While investigating folklore of the airline industry, Santino heard several stories about the supposed ghost of a flight engineer—the origin of John G. Fuller's book *The Ghost of Flight 401*. Santino's focus is on how people's willingness to acknowledge belief in the supernatural varies according to the situation.

Taubes, Gary. "Cold Fusion Conundrum at Texas A&M." *Science*, 248:1299-1304, June 15, 1990. Detailed investigative report on cold-fusion experiments at the one laboratory at Texas A&M (among three there that did experiments) where tritium was reported and used as evidence in support of Utah cold-fusion claims. Openly discusses for the first time questions that have been raised about the possibility that the tritium may have resulted from, if not inadvertent contamination, "something more insidious." Reports that researchers both at A&M and else-

where have asked that questions about "possible fraud" be resolved. The episode "has become a case study in the damage done when questions of fraud, legitimately raised, are not seriously addressed by either the lab chief or his institution."

Wilson, James E., II, and Jerome J. Tobacyk. "Lunar Phases and Crisis Center Telephone Calls." *Journal of Social Psychology,* 131(1):47-51, February 1990. Analysis of 4,575 crisis center telephone calls recorded over a six-month interval suggests that although day-of-the-week and monthly cycles account for some of the variability in total crisis center calls (2 percent and 3 percent of the variance, respectively), the 28-day lunar cycle accounts for a negligible amount of the variance (less than 1 percent). The results show no significant relationship between lunar phases and frequency of crisis center calls. However, the study did find that workers in the crisis center were significantly more likely to *believe* in a lunar effect on the telephone calls received than a non-crisis-center group, indicating they may tend to construct illusory correlations."

Young, Dwight L. "A More Perfect Human." *Wilson Quarterly,* 14(2): 120-127, Spring 1990. An article about Orson Squire Fowler, an eccentric architect and publisher who was a major promoters of phrenology in the early nineteenth century. A reformer in many areas, he managed to associate the study of head shapes with such disparate fields as education, women's suffrage, penology, and diet. His revolutionary theories on sexuality led to eventual disgrace.

—Kendrick Frazier and Robert Lopresti

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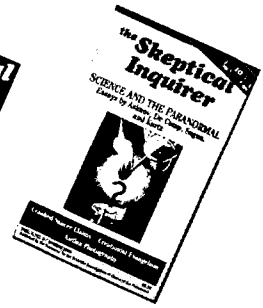

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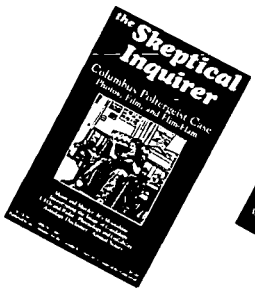

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Letters to the Editor

Police, media, and Satanism

Re Robert D. Hicks's connection between the news media and the law-enforcement model of cult activity ("Police Pursuit of Satanic Crime," Part I, *SI*, Spring 1990):

During February 1989, Hillsdale County, a rural area in south-central Michigan, was replete with out-of-the-ordinary occurrences ranging from a police presentation on Satan worship to sightings of alleged Bigfoot tracks. As a teacher-therapist for emotionally disturbed adolescents and a member of CSICOP's Education Subcommittee, I took special note of the etiology of these events.

One of our city police officers had been sent to a seminar on Satanism à la Hick's description. The result was that he returned to Hillsdale committed to warning the vulnerable citizens of this impending scourge. A "seminar" was arranged for interested locals. Our county daily newspaper was alerted, and the police/news-media team-up was a disaster.

The educational session consisted of a few slides of mutilated domestic animals, a moralistic lecture on the evils of heavy-metal rock and "Dungeons & Dragons," and intimation of trouble with a capital "T" that rhymes with "P," and that stands for paraphernalia. The focal point of the presentation was a "documentary" on Satanism. Amazingly, this cinematic production was the Geraldo Rivera Halloween special.

The news media outdid the police in irresponsibility by turning this misguided pedagogical effort into a cause célèbre. A score of television and print reporters converged on the area. A meeting intended for 100 had to accommodate ten times that many. People came from Ohio and Indiana as well as Michigan. Many had to be turned away. The event and its imagined implications were reported for a week thereafter on CNN, NBC, and other national television networks. The central exhibit was a cat hung from the rafters of a barn.

The impact upon the middle school students, whom I serve professionally, was the dramatic appearance of Satan symbols on clothing and related graffiti on school property where none had existed before. Many youngsters proffered mutilation stories, including rumors of human corpses under bridges and police cover-ups. Among parents there was much hand-wringing and gnashing of teeth.

In mid-March 1989, I was interviewed by the *Hillsdale Daily News* to explain the psychodynamics of February's events. The article was given page-one exposure and served as a tonic to recent distortions.

The very next day, in exactly the same page-one space, the *Hillsdale Daily News* headlined an article "Bigfoot Hunters Scour County!" And so it goes.

Lincoln C. Miller
Hillsdale, Mich.

Kudos is due for Robert Hicks's article. In particular, he mentioned that the role-playing game Dungeons & Dragons, which is based on fantasy fiction, is unjustly linked to the occult and Satanism.

There are multiple claims against this game: that it causes teen suicides, murders, violence, psychological problems, lowered school grades, and even divorce! This is rich material for the true skeptic, although D&D is heard about more often than seen, which was why such claims were believed among the unwary.

I am an actual fan of the three versions of the D&D game; we number at least five million on this continent alone. However, fans of D&D and other role-playing games are found mostly in individual groups, as isolated from one another as bridge players are. We were quite bewildered with stories against D&D; and because of the dispersion of game fans, even some "gamers" believed them. However, if understanding were more widespread, one could no more spread the stories than spread a claim that bridge players are a worldwide neo-Nazi recruitment network.

Very briefly, a role-playing game (RPG) is where, instead of playing pieces, players control imaginary characters set in some fantasy or science-fiction story devised by a "game master." There is no competition; players act cooperatively to resolve the plot of the story and have their characters succeed. It is a purely verbal, adult form of childhood "let's pretend" games and consists of books and printed charts, with lengthy statistical rules to decide outcomes with dice rolls.

Dungeons & Dragons was one of the earliest (TSR, Inc., 1973), and Advanced Dungeons & Dragons has the longest set of rules (1.4 million words, or twice the size of the Bible) and is still the most popular RPG (it even has its own thick monthly magazine, *Dragon*). Its topic is generic fantasy fiction.

When the stories came out, I researched them and formed an informative committee with other game fans around the world.

Fact #1: D&D evolved from obscure complex-game hobbyists and is based on fantasy-fiction, which was also initially obscure. When the game became popular, there was no easy comparison or basis to understand it.

Fact #2: The earliest claim of an "incident" linked to D&D was the disappearance, retrieval, and later suicide of young James Dallas Egbert III from the University of Michigan in 1979. The book *The Dungeon Master*, by detective William Dear (Ballantine, 1984), explains the case, where the detective purposefully delayed explanations of the true causes (drugs, homosexual prostitution) to protect the boy. *D&D got blamed in place of more mundane, understood causes.*

Fact #3: This model of a "criminal cause" was seized upon by Fundamentalist Christian groups, particularly since D&D was associated with teenagers, who are guilty of *something* by definition. It is also a fact that the earliest critic of D&D (Rev. John Torrell, Sacramento) claimed as early as 1980 that D&D players "can't tell the difference between fantasy and reality." This is ironic in view of Torrell's religious newsletter (*The Dove*), which details what he calls the "five-year surrender plan" of the U.S. to the Soviet Union (which began in 1986), and says George Bush has devoted his life to Satan!

Fact #4: The "documented D&D suicides" of teens turn out to be mostly hoaxes. The parents of some teens cited, such as Roland Cartier and the Erwin brothers of Colorado, bitterly resent the claims and provide the more likely causes. There are parents, however, who claim their offspring committed suicide because of D&D in order to mask actual causes relating to family strife. In any case, suicide motives are anyone's guess, and a look at figures even suggests that D&D players are *less* likely to commit suicide than their peers.

Anyone interested in this issue can write for more details to the Committee for the Advancement of Role-Playing at the following address: In the U.S.: William Flatt, 8032 Locust Ave., Miller, IN 46403. In Canada: Pierre Savoie, 22-B Harris Ave., Toronto, ON M4C 1P4. Or to the Game Manufacturers Association: Greg Stafford, Chairperson, c/o Chaosium Inc., 950A 56th St., Oakland, CA 94608.

Pierre Savoie
Toronto, Canada

Robert Hicks made some interesting points about the alleged cult epidemic throughout the country. I've been involved with many of these claims for several years. In 1983, I wrote a three-

part series for my high school newspaper on the controversy surrounding the game Dungeons & Dragons, and after slogging through some of the most poorly written and fully libelous literature on the subject (or any subject) I have ever subjected my fragile psyche to experience, I ran into many similar claims: Bob Larson, a radio evangelist in Denver, claiming that he heard a warlock proclaim that D&D was designed as a training aid for satanic initiates; Christian Life Ministries in Sacramento claiming that the game was of either satanic or communist origin for the purpose of making impressionable young children question Christian teachings; and Mel and Norma Gabler, the Texas book censors, putting out whole workbooks on the subject in order to inform the appropriate officials that one game of D&D caused good Christian teenagers to become screaming mother-stabbing, father-raping Satanists bent upon the destruction of the civilized world and parts of Lewisville, Texas. These people offered no proof of their claims, either, but their propaganda was enough to convince many toy and hobby shops to stop carrying the game and its supplements because of its "occult influences."

After spending nearly a year researching my series (the advantages of being a high school student), I found that none of the opponents of the game had any verifiable proof of a connection between D&D and either cult activity or teen suicide. Nearly all of the alleged proof was anecdotal or manufactured.

Paul T. Riddell
Dallas, Tex.

We hope to have an article about the Dungeons & Dragons controversy at some time in the future.—ED.

I have read with great interest the article on satanic crime. While Hicks must be commended for his effort to bring light out of darkness in this field, his erroneous reference to "the lack of criminal convictions for these crimes" smacks sadly of inadequate homework.

Granting Hicks's theory that various psychopaths may adopt Satanism or other cult beliefs as justification for their own aberrant behavior, I will pass over the numerous "self-styled Satanists" currently serving time for homicide and other crimes around the country. In fact, elements of Satanism and/or voodoo have been uncovered in nearly 10 percent of American serial murders since 1969. Ironically, John Gacy—referred to by Hicks as a "self-styled Satanist"—does *not* belong in this category. Gacy has never professed a belief in the occult, nor has a cult connection been advanced by any investigator close to his case.

Jack Buchanan
Nashville, Ind.

We commend Robert Hicks for his article deploring the hoopla and hysteria surrounding reports of satantic/cult/occult crime. He does however, in a couple of instances, display a dangerous ignorance in an area which, in stark contrast to his main subject matter, is *in fact* "a problem of national proportions."

The physical, sexual, and emotional abuse of children is epidemic in our society. When Hicks (p. 278) belittles "children's uncorroborated testimony [which] caused the indictments of many adults for sexual abuse," and then strongly suggests that the lack of criminal convictions for these and other crimes is evidence of their nonoccurrence, he contributes to a hyperskeptical and complacent general mentality that enables the abuse of children to continue.

Joseph and Jennifer Giandalone
Amherst, Mass.

Jennifer Giandalone is a member of the National Child Rights Alliance and managing editor of NCRA's quarterly newsletter, The Freedom Voice.

Congratulations on an excellent issue of *SI* (Spring 1990). As a practicing forensic psychologist, as well as a concerned parent, I found it invaluable. Occasionally I am asked by local media about "satanic" involvement in child sexual-abuse cases with which I am involved. In more than 300 such cases I have never encountered one with a "satanic" basis, but the thirst for this type of novelty seems unabated.

Unassailable proof for "synchronicity" will be found in the fact that I have become involved in a mini-issue concerning a collection of pseudoscientific books in our children's elementary school library. Three days earlier I had sent a letter to *SI* inquiring about a list of titles that would foster a more skeptical approach to pseudoscience, one which would be suitable for younger children—and voilà, at the end of the issue, in the Letters to the Editor section, I find at least four usable and appropriate titles.

Although I read every issue of *SI* with great interest, this one truly deserves an Academy Award of some sort.

Gary W. Lea, Psy.D.
Registered Psychologist
Kelowna, B.C.
Canada

Robert D. Hicks replies:

Buchanan criticizes me for not doing my homework and lists several cases "where multiple cultists have been identified and/or incarcerated." Unfortunately, the case citations he appended read like newspaper headlines, noting that so-and-so was convicted of the "ritual/cannibal murder" of another, for example. My point is that the crime investigated and prosecuted *was murder. Until very recently, criminal laws in most states have not appended "ritual" to such crimes. (Idaho and Illinois, for example, have recently added laws criminalizing certain "ritualistic" or "occult" activities, legislation based almost entirely on the stories of cult survivors. We will have to wait to evaluate the utility of such legislation.)*

Officers should properly investigate crimes, not ideologies. In fact, some of the cases Buchanan offers as evidence of my ignorance betray his own. For example, he cites the David Berkowitz "Son of Sam" killer for his involvement in a satanic cult. But the cult connection, much sensationalized in Maury Terry's The Ultimate Evil, *rests on Terry's own tenuous speculations, criticized in Arthur Lyons's* Satan Wants You, *and in my own forthcoming book. Buchanan also takes the Matamoros multiple murders as satanic (see my Part 2,* SI, *Summer 1990, p. 384).*

Perhaps Buchanan will listen to Special Agent Kenneth Lanning of the FBI: "The . . . investigator must objectively evaluate the legal significance of any criminal's spiritual beliefs. In most cases, including those involving Satanists, it will have little or no legal significance. . . . The crime is the same whether a child is abused or murdered as part of a Christian, Hare Krishna, Muslim or any other belief system. Crimes generally are not labeled with the name of the perpetrator's religion. . . . If criminals use a spiritual belief system to rationalize and justify . . . their criminal activity, should the focus of law enforcement be on the belief system or on the criminal activity?" (quoted in Police Chief, *October 1989, p. 80). Buchanan should define "cult" or "occult" before applying the labels and evaluate their significance in the criminal process. Also, I mentioned John Wayne Gacy because he was offered as an example of a "self-styled Satanist" at a cult seminar I attended.*

My article did not deal with child abuse, yet the Giandalones take me to task for a complacent mentality about the problem. But they argue apples and oranges. I'm well aware of the estimated pervasiveness of child abuse in the United States (and of the literature they cite) and support its rigorous investigation, but here I allude to the sensational criminal cases of so-called ritualistic child abuse in day-care centers in which the focus on satanic or occult elements ignored the possibility of actual *abuse.*

The FBI investigation into the conduct of the Jordan, Minnesota, child abuse case, the conclusion of the jury in the McMartin case in California, the California Attorney

General's investigation into the child-abuse cases in Bakersfield, California, and the reversal of convictions in the Michelle Noble and Gayle Dove day-care case in El Paso, Texas, all attest to the same investigative and prosecutorial problems: the focus on bizarre elements rather than the alleged crime and the conflation of therapeutic and law-enforcement goals and methods, which in some cases resulted in concocted tales of the occult told by children much prompted and coached.

Ironically, through such cases the methods of therapists, prosecutors, and the police have improved to meet legal requirements and to avoid the possibility of fabrication and the cross-germination of stories among children and investigators. If we rely on children's testimony, then that testimony should be free of taint. Unfortunately, by voicing such a criticism, the Giandalones make me part of a problem rather than the solution. Such a criticism is usually leveled at those who criticize child-abuse-case methods, but I insist that a professional dialogue on the topic is essential. I invite the Giandalones to examine the detailed arguments about such cases in my forthcoming book, In Pursuit of Satan.

Improving science education

One major obstacle to the improvement of science education was not mentioned in the articles by Sagan and Seaborg (*SI*, Spring 1990): the ideology of egalitarianism that is dominant in our culture. It denies the existence of individual variations in aptitude and disregards the fact that many people either cannot or will not learn much science or mathematics no matter how much money we spend on the schools. The segregation of students by ability, which could aid the more gifted by exposing them to challenging and interesting material, is said to encourage "elitism." Strangely, this argument is not applied to athletics. We do not hear demands that every high school student be given a varsity letter regardless of his athletic performance. Yet the successful athlete is rewarded by the esteem of his peers and by publicity, which might lead him, and others, to think that he is better than average at sports.

If the recommended reforms of science instruction are implemented, as I hope they will be, I predict nevertheless that there will be no major improvement in the nation's scientific literacy until current attitudes are changed. If we attempt to teach all students a substantial amount of science, as opposed to merely requiring them to be physically present in a classroom, the resulting failure rate will not be tolerated by parents or by the educational establishment.

Daniel Shotwell
Alpine, Tex.

The deplorable state of science education is a common theme these days, and properly so. We hear regularly from physicists in particular about this, and usually grand old physicists—statesmen and administrators of the field—as well as a blizzard of government reports. Institutes are set up, like that in honor of Ernest O. Lawrence and the new Seaborg Center, to provide curriculum materials and encouragement to teachers and students. And, as the very figures cited in Seaborg's article prove, they don't work either.

What to do? Apparently universities don't have much trouble turning out okay physicists. What universities have that lower schools don't is live physicists (or soon-to-be physicists) doing the teaching. Maybe that is the answer.

In fact, if working physicists are as truly upset as they say they are, you would expect a large percentage of them to take the time to make regular weekly appearances in teacher's training colleges—live resources, you might say—on a voluntary basis. Certainly this would be a better way of inspiring and informing would-be science teachers than pontificating through mountains of paper and film strips from on high.

Jake Page
Corrales, N.M.

Carl Sagan writes: "Why in all America is there no TV drama that has as its hero someone devoted to figuring out how the universe works?" Such a TV drama, *Probe*, created by Isaac Asimov and myself, aired in the winter of 1987-88 on ABC on Thursday nights.

Although we made the mandatory concessions to character, plot, and action that television drama requires, our scientist-protagonist, Austin James, was nevertheless a no-nonsense scientific investigator of natural and paranormal mysteries. Episodes dealt with artificial intelligence, genetically altered viruses, hypnotic suggestion, nuclear accidents, and murder by hologram. We even debunked alien visitations and witchcraft. (Austin, in spirit, was a card-carrying member of CSICOP.)

Unfortunately, *Probe* did not last beyond the two-hour pilot and six episodes. While it's true the network relegated us to the "death slot" opposite Bill Cosby (a sure indication that ABC was not really keen on doing a science show) and that Universal Studios did not provide us with the support necessary to do a show of *Probe*'s complexity, I believe the real reason the series did not survive was the American television-viewing audience's indifference to anything involving science.

Michael Wagner
Lorimar Productions
Culver City, Calif.

Carl Sagan, long one of my heroes, seems chauvinistic in talking about how poorly American young people are doing in math and science. I've lived in Europe and now I'm living in Japan. Perhaps Sagan will tell us in which country there is a television drama "that has as its hero someone devoted to figuring out how the universe works." Japanese cartoons promote the same view of the mad scientist as American cartoons do. What's worse, some of the "mad scientist" cartoons shown in America are drawn in Japan!

Gosh, in Europe and in Japan people are as apt to fall for pseudoscience as people from anywhere else. Wishful thinking aside, studying science in school doesn't prevent it. Pre-Hitler Germany was perhaps far more advanced than the U.S. in theoretical science and math, but that didn't prevent the National Socialists from coming to power.

As for contemporary Japan, some of my students here were graduates of top Japanese universities; their subject was applied science—engineering. Yet several said with a straight face that UFOs could make high-speed 80 degree turns! I, a science illiterate—no, a science phobe—all through college, had to explain basic principles of physics to bright young fellows with B.S. and M.S. degrees.

Sagan should come to high-tech Japan sometime and visit typical Japanese high schools. Not as Carl Sagan, science genius, but under another name. If he goes as himself, the teachers will coach the students with dozens of questions—in English, even!—and Sagan will return trumpeting the Japanese love of science.

But if he were to go, say, as me, he would see how most of the students mindlessly memorize facts in order to pass exams and how few really care about the beauty of the universe around us. Just like back home!

Monty Vierra
Hiroshima, Japan

Wisdom in science

I was intrigued and appalled to read letters (*SI*, Spring 1989)—some from teachers—finding fault with Isaac Asimov's excellent article, "The Relativity of Wrong" (*SI*, Fall 1989). It's no wonder U.S. students fare poorly in science and math when compared with students educated in other countries.

David Carl Argall's letter, for instance, claims that scientific writings of 1880 would have no scientific value today. In fact, the writings of scientists and engineers from Newton back through Archimedes are in constant use

and of inestimable value. Even after 2,500 years, Archimedes is still right about many things. His principles of buoyancy underlie my entire craft. *All* of Newton's physical laws remain completely intact—the foundation of modern science and engineering.

In my own field—the design of yachts and small commercial vessels—one of my most reliable references is Attwood's *Theoretical Naval Architecture,* printed in 1899. It is so old it uses a *Monitor* class ship—as in the Civil War's *Monitor* and *Merrimac*—as one of its examples. I prize this book for its clarity and spare readable style. Although I must be careful to cull out antiquated structural materials and building practices, the physics and engineering principles have not changed one whit. In fact, the grandfather of naval architecture texts is Chapman's *Architectura Navalis Mercatoria,* published in 1768. A facsimile edition sits on my shelf and is also a valued reference. Though shipbuilding practice has certainly changed in the intervening years, again, every physics and engineering principle remains sound. The drafting is so intricate, precise, and beautiful it is breathtaking.

Most amusing of all was Argall's pride in being certain that he—and all the rest of us—should have the wisdom to know we know nothing. Specifically, he concludes, "Knowing that you know 'nothing' is a mark of wisdom." I hope he is not a teacher, for then he would have the "wisdom" to "know" that he cannot even know his own name. Of course he does seem to know one thing with absolute certainty. (There, poor Isaac, there's hope for you yet.) Argall knows, with total clarity and precision, that it is wise to know nothing, but then he must "know" something, so he can't be very wise!

Dave Gerr
New York, N.Y.

In your Spring 1990 issue you printed a letter from John G. Fletcher of Pleasanton, California, in which he relates the story of a precocious first-grader who was chastised by his teacher for insisting that Alpha Centauri is the nearest star. I read this letter with some amazement, because the event described happened to me 23 years ago as a first-grader in a school not far from where Fletcher lives.

I still recall the event rather vividly. I was so distraught and angered that I refused to go to school the next day. Fletcher may be interested to know that as an adolescent I read literally every collection of Isaac Asimov's science essays and that I am now completing a Ph.D. in (of all things) astronomy.

And I still detest "trick questions."

Tom Little
Hyattsville, Md.

Editors and evolution

Although newspaper editors may well be poorly informed about the evolution-creation controversy, Michael Zimmerman's study (*SI,* Winter 1990) is difficult to interpret. Many of the questions, and therefore the answers, are ambiguous.

Part of the ambiguity appears to be rooted in a lack of understanding of the practice of journalism. For example, the survey asks editors where they would run a well-written story on evolution or creationism. Such a question is confusing to a journalist, because the placement of a story in the paper depends upon how "newsworthy" it is thought to be, not the skill with which it is written. A newsworthy story on evolution or creationism would run in the news section; less important news stories would run in the science or religion sections, along with feature stories on those topics. An editor needs far more information than "a well-written story on creation science" to give an educated answer about its placement in the newspaper.

Another source of ambiguity lies in interpreting the responses. For the first 22 statements, editors were asked if they "strongly agree, mildly agree, no opinion, mildly disagree, strongly disagree." Zimmerman often looked at only the

extreme responses in drawing conclusions. For example, he said that "only 42 percent of the editors agreed strongly with the correct statement 'The Earth is approximately 4-5 billion years old.' " But what seems most striking to me about the response is that only about 5 percent of those polled (judging from the graph) disagreed—strongly or mildly—with that statement. (A little more than 20 percent didn't want to venture a guess.) And only about 5 percent agreed—strongly or mildly—that the earth is 6,000 to 20,000 years old. As a former science editor, I must admit that I was surprised to find that my colleagues had such a good grasp of the earth's age.

The editors did poorly in defining evolution, according to Zimmerman. Nearly half said that this statement—"Evolution involved a purposeful striving towards 'higher' forms (that is, a steady progress from microbes to humans)"—best described evolution; less than a third preferred the phrase "survival of the fittest." But is that really a fair indication of scientific literacy?

The idea of directed progress in evolution is a semantic trap. In *Wonderful Life: The Burgess Shale and the Nature of History* [see review in this issue], Stephen Jay Gould points out that even scientists sometimes have trouble steering away from language that implies directed evolution. "The march of progress is *the* canonical representation of evolution—the only picture immediately grasped and viscerally understood by all," Gould says. While his books are "dedicated to debunking this picture of evolution," four translations of his work have used jacket illustrations (over which he has no control) showing the march of human progress, he adds. Surely a newspaper editor could be forgiven for an error often commited by scientists themselves.

Another question that is hard to interpret is the one on whether creationism should be taught in public schools. Although Zimmerman assumes that editors are anti-evolution if they favor the teaching of creationism, that assumption doesn't stand up. The teaching of creationism doesn't have to mean teaching it to students as true. Surely the most effective way to acquaint students with that issue is to present the factual evidence for both creationism and evolution and trust the students to make their own reasoned judgments.

By pointing out problems in this survey, I by no means wish to imply that journalists are above reproach in handling evolution and creationism. Journalists often make errors in science coverage. It seems to me, however, that the principles journalists use in assessing newsworthiness have more to do with those errors than their lack of knowledge on any particular issue. Stories are newsworthy if they are timely (have just happened), involve prominent people, involve controversy or violence, affect or interest many people, are part of a trend, or appeal to readers' emotions (few stories will have all of these qualities). While these principles serve journalists well in the coverage of many topics, they can be ill-suited to science coverage. They may lead journalists to emphasize personalities or conflicts, and they may discourage the coverage of intellectually important topics that aren't newsworthy in the traditional sense.

The purpose of the survey was to find out how much editors knew about evolution and creationism on the assumption that such knowledge affects coverage. But journalists do not have to be (and, indeed, cannot be) walking encyclopedias to do their jobs well—they need to know how to get the information they require and how to evaluate sources of information. When journalists are insecure about assessing the validity of sources, they tend to write stories that resemble a debate, with the writer as moderator. As long as contrary opinions are roughly equal in validity, this strategy is a fair one. But when one position is much weaker than the other, what appears to be a balanced approach actually gives undue weight to the weaker side. A survey aimed at finding out how comfortable editors are in

seeking and assessing science information would tell us more about how well they are doing their jobs.

Karen Freeman
Asst. Professor of Journalism
Pennsylvania State University
University Park, Pa.

Newman the prophet

Since you are keeping track of Joseph Newman's "energy generation system" (*SI*, Spring 1990), I thought you might like to hear the latest from its inventor. On January 23, 1990, Newman appeared on a local television station (apparently he purchased a half-hour) to tell the following things to the world: that all of the world's major religions, as well as Edgar Cayce, Nostradamus, and several other prophets, had predicted that shortly before the year 2000 God's great prophet would come to the world and that he, Joseph Newman, was that prophet. He further claimed to have a virgin birth, but two minutes later was talking about how his older brother had not died but had been taken directly to heaven by God to get Joe's attention in 1944. That this was from God was supposedly authenticated by a halo around the sun on the same date.

The program ended with an appeal to send money.

Wayne D. Cowey
Gulfport, Miss.

Newman's machine

I was pleased to read in the Spring 1990 issue that backyard inventor Joseph W. Newman has once again been thwarted in his constant attempts to bulldoze the U.S. Patent Office into granting him a patent on a device that cannot possibly accomplish what he claims for it.

Your readers might remember that Newman first claimed that God had appeared to him in a dream and given him alone the "secrets of the universe" from which he then designed his unlimited "energy machine," alleged to derive power from an imaginary particle that Newman called a "gyron." Physicists have detected no such particle.

Any first-year electrical engineering student could have told Newman that his Rube Goldberg AC generators would never in a thousand years repeal the laws of thermodynamics or conservation of energy, but he was apparently able to dupe investors into pouring thousands of dollars into this worthless device. If Newman takes his claim to the U.S. Supreme Court he will only find that the Court will defer to the NBS and its findings that Joseph Newman had not been able to prove his claims.

One scientist, who has examined Newman's energy machine at close range, says that it is nothing more than a crude alternating current generator producing a "spike" AC output at each turn of the armature and requiring dry or wet batteries for its field current and rotating power.

The intermittent power output makes it useless for any practical application and even though Newman has claimed an efficiency of from 100 percent to as high as 800 percent, the device actually wastes about 60 percent of its power input.

William H. Watkins
Williamsburg, Va.

Most Mensans critical thinkers

I hope to correct a mistaken impression of Mensa, the high IQ society, that readers of Robert Sheaffer's Psychic Vibrations column (*SI*, Spring 1990) and of letters in earlier issues may have received.

While it is true that some Mensans are interested in, or involved with, psychic phenomena and the New Age, these members are in the minority. As with the proponents of such beliefs in the general population, this minority receives far more than its fair share of media attention.

Most members of Mensa are critical thinkers, many of us are trained scien-

tists, quite a few are subscribers to the SKEPTICAL INQUIRER, and at least one prominant Mensan—Isaac Asimov—is a Fellow of CSICOP.

Joan E. Bauman, Ph.D.
Director of Science
and Education
American Mensa Ltd.
St. Louis, Mo.

Alcoholism, disease or not?

The indignation expressed by critics of my book review and the good work of Professor Fingarette (*SI*, Winter 1990, pp. 198-201) comes as no surprise (Letters, *SI*, Summer 1990, pp. 440-442). Accusations regarding the merit of research debunking the disease model of alcoholism (amid the ad hominem attacks I consider unworthy of further response) are emotional and groundless.

For a review of "the controlled drinking controversy," including the exoneration of Drs. Linda and Mark Sobell, see G. Alan Marlatt's article of the same name in *American Psychologist* (1983, vol. 38, pp. 1097-1110). For a critique of the alleged "clear" and "stunning" evidence of the heritability of alcoholism, see Professor of Biochemistry, Emeritus, David Lester's article titled "The heritability of alcoholism: Science and social policy," in *Drugs & Society* (1989, vol. 3, pp. 29-68).

With regard to the recent study of the dopamine receptor gene and alcoholism published in the *Journal of the American Medical Association*, as Paul Billings, of Harvard Medical School and director of the Clinic for Inherited Disease at New England Deaconess Hospital, says: "If this type of genetic analysis was carried out for a disease or a behavior less attractive than alcoholism, it would never get published. It tells you nothing of significance. The study is from the genetic dark ages." Errors in genetic studies on alcoholism include inaccurate definitions of "alcoholic," the misrepresentation of correlational findings as causal, addiction to multiple substances, and—most important—the lack of control for environmental influence.

I trust that *SI* readers are now curious enough to investigate the claims made in the name of science by those who believe in the disease model of alcoholism. The stakes are considerably higher than *SI*'s standard fare.

Jeffrey A. Schaler
Silver Spring, Md.

More good books for kids

As a clinical psychologist who works with disturbed adolescents and as a father of an eight-year-old, I am very interested in good reading for children. (See Letters, *SI*, Winter 1990, p. 334.) I have found some additional works that I think are all good in their own ways. Incidentally, *The Magic Detectives*, by Joe Nickell, is excellent, and my son loves it.

Osborne Publishing has a lot of good science-oriented books for kids and has a three-volume set that is specifically for teaching rational, critical thinking: *All About Monsters*, *All About Ghosts*, and *All About UFO's*. They use varying typefaces and colorful pictures to capture kids' interest. *How to Think Like a Scientist*, by S. P. Kramer (Thomas Y. Crowell) is designed to teach children how to solve problems using the scientific method and utilizes examples that will make sense to kids.

For younger children, the *Berenstain Bears* series has great stories for teaching kids about moral and social questions (such as lying, peer pressure, junk food, etc.) from a secular, rational perspective, and even has some nonreligious Christmas stories.

Let's support these publishers; they are few and far between.

Selmer E. Wathney
Sacramento, Calif.

Murphy's law, Al's law, and Coleslaw

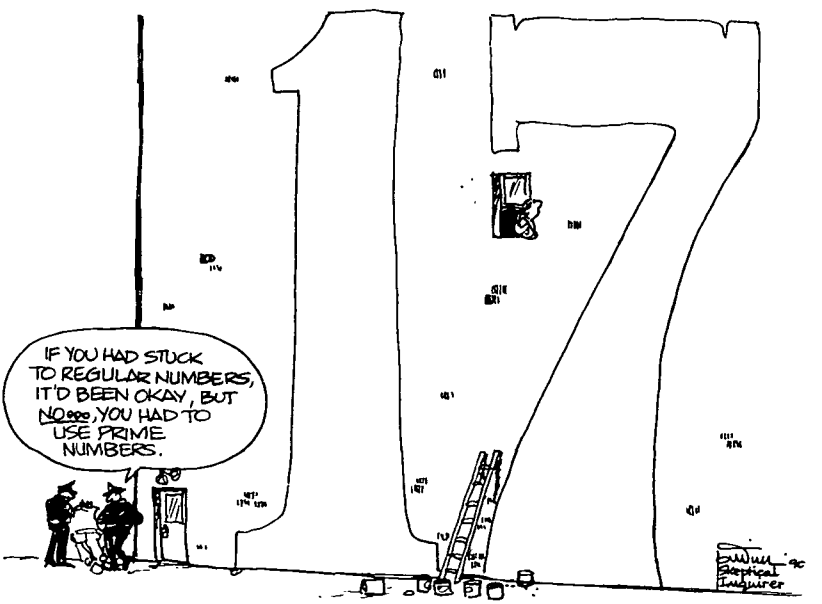
To clear up the confusion expressed on the questionably related Murphy's Law, the law of large numbers, Napier's Law, and Price's Law (Letters, *SI*, Spring 1990): In an attempt to either confirm or refute the law of large numbers I recently purchased an enormous canvas, a tall ladder, and several buckets of paint. By means of these three artifacts I was able to print several numbers so large as to be more than 12 feet in height. The actual numbers were, modestly enough, 17, 23 and 47. After several hours of this I was apprehended by the law on the grounds of defacing property.

As for the assorted laws of Murphy, Price, et al., I will say only first that I have always preferred Al's law. And why Murphy never gave Al credit is something that has never been clarified, not to mention mentioned.

All of these, it seems to me, may appropriately be subsumed under the rubric of Cole's Law (sometimes inappropriately rendered as Coleslaw) which stipulates that in any half-pound plastic container of coleslaw the percentage of slightly greenish cabbage-shavings will be less than the percentage of slightly whitish pieces.

While it is true that if one of these slivers of cabbage falls to the floor it will be likely to land on the side most heavily covered with coleslaw goop, I fail to see the relevance of that to the fact that not only was the rabbi in Frans Kok's story funny but all the rabbis about whom stories have been told for the past 3,000 years have been funny, whereas in reality all the rabbis I have ever met have been of astonishingly sober mein.

Steve Allen
Van Nuys, Calif.



Clarifying comment on Jahn

I was somewhat dismayed to find two letters in the Winter 1990 issue of the SKEPTICAL INQUIRER suggesting that authors had missed the point of an earlier letter of mine commenting on the work of Schmidt and Jahn.

To refresh readers' memories, I had pointed out that dismissal of the experimenters' work because the result was "close to 50 percent" could not be supported statistically as an event arising from chance. I suggested "that other mechanisms are represented in the data."

It appears that both correspondents inferred from my comment that I had concluded the results supported some form of paranormal event.

An earlier draft of my letter actually included the words "such as poor data or faulty experimental design"; however I deleted the phrase because I thought that was belaboring the obvious.

John R. Smyrk
Collaroy Plateau, Australia

World History Chart

I was glad to see your report on the World History Chart (Spring 1990, p. 315).

With respect to that chart, you might be interested in the following background. When *Biblical Archaeology Review* first ran the ad for the chart, their readers were so incensed at the biases in the chart that their protests to the editor prompted *BAR* to print the following disclaimer with the ad, which continues to run in the magazine:

> This chart reflects the traditional Biblical time for the creation of the world, the Flood, etc., as well as certain historical events as documented in the *Book of Mormon* and other theologies.

Scientific American ran the ad for the chart several times in 1989 with no disclaimer. I do not think it has run in *Scientific American* in 1990; and, if not, I wonder whether reader reaction had anything to do with the stoppage. And the ad is in the March/April 1990 issue of the journal *Archaeology* with no disclaimer.

C. Leroy Ellenberger
St. Louis, Mo.

The letters column is a forum for views on matters raised in previous issues. Please try to keep letters to 300 words or less. They should be typed, preferably double-spaced. Due to the volume of letters, not all can be published. We reserve the right to edit for space and clarity. Address them to Letters to the Editor, SKEPTICAL INQUIRER, 3025 Palo Alto Dr. NE, Albuquerque, NM 87111.

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(continued on next page)

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MALTA. Contact: Vanni Pule', "Kabbalah," 48 Sirti St., The Village, St. Julian's.

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NETHERLANDS. Stichting Skepsis, Rob Nanninga, Secretary, Westerkade 20, 9718 AS Groningen.

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- Maintains a network of people interested in critically examining claims of the paranormal.
- Prepares bibliographies of published materials that carefully examine such claims.
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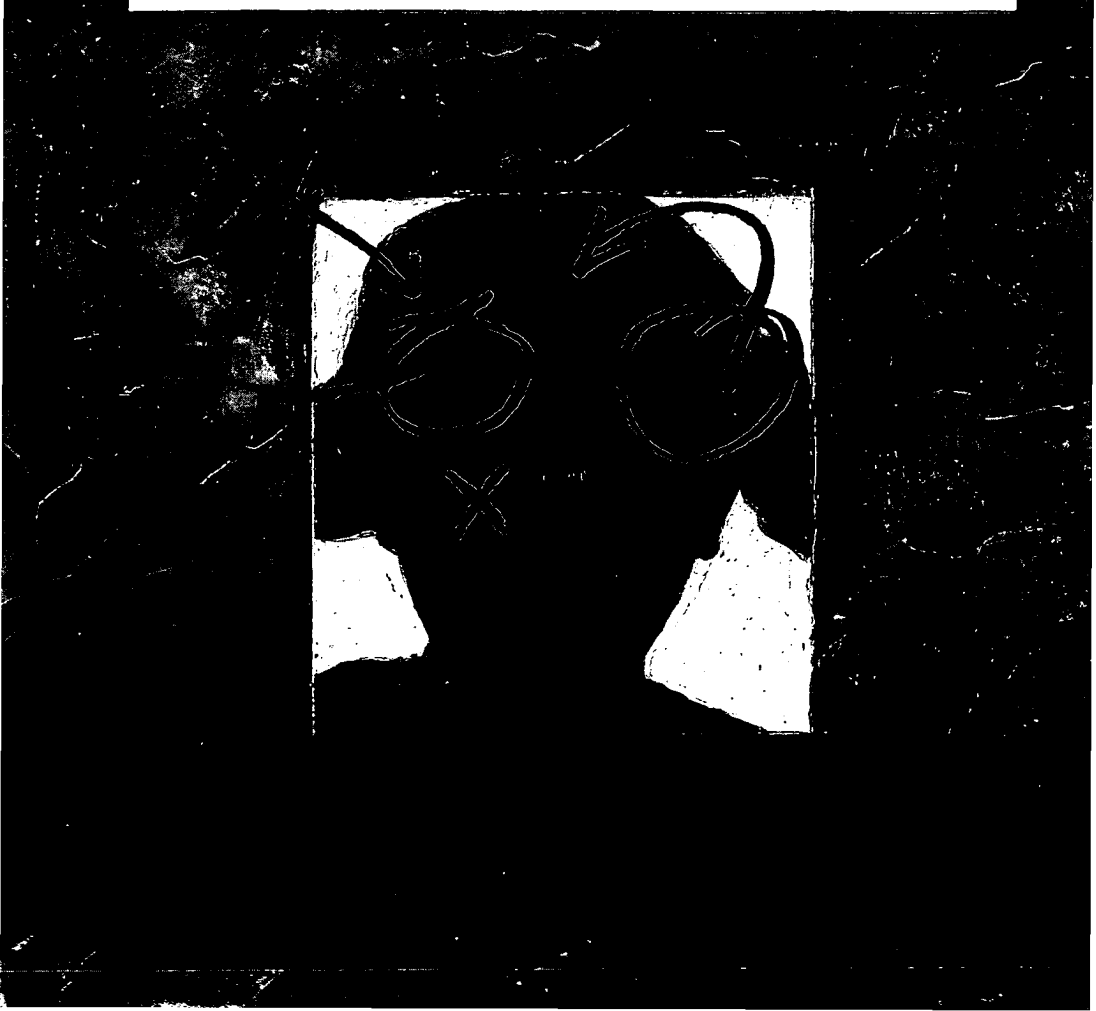
- Publishes articles, monographs, and books that examine claims of the paranormal.
- Does not reject claims on a priori grounds, antecedent to inquiry, but rather examines them objectively and carefully.

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